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FEDERATION OF MALAYA

NUTRITION SURVEY
September-October 1962

A Report by the Interdepartmental Committee on Nutrition for National Defense

September 1964

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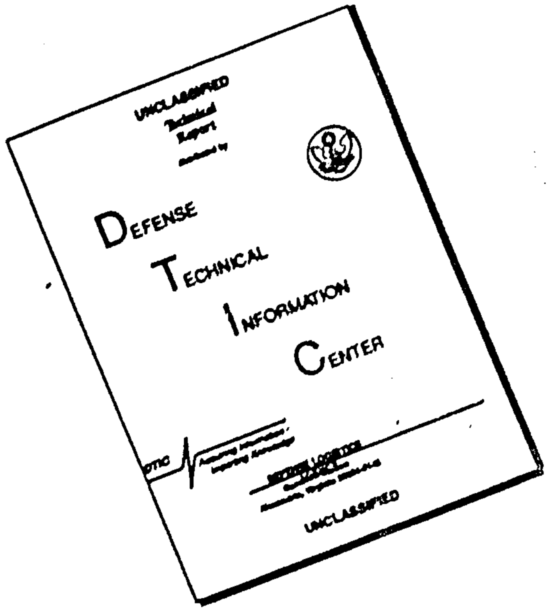

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
WASHINGTON 25, D. C.

MANPOWER

September 30, 1964

Excellency:

On behalf of the Interdepartmental Committee on Nutrition for National Defense (ICNND) of the United States of America, it is my pleasure to transmit the report of the nutrition survey of the Federation of Malaya which was conducted by a joint Malayan--United States team in September--October 1962.

The preliminary survey report was discussed in March 1964 with representatives of the Ministries of Health and Defense, the Institute for Medical Research, and the American Embassy by Dr. Howerde E. Sauberlich, Deputy Director, and Dr. Paul H. Weswig, Nutritionist. The excellent suggestions received have been incorporated in the report.

The Committee and the members of the United States survey team wish to express their appreciation to the many individuals in Malaysia who contributed so much to the success of the survey. We are particularly indebted to the Ministries of Health and Defense, the Institute for Medical Research, and the Malayan members of the survey team for their cooperation and support in this joint endeavor.

Sincerely yours,

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PREFACE

At the request of the Malayan government the United States government sent a team of physicians, dentists, nutritionists, chemists, food specialists and parasitologists to Malaya to work with a counterpart team of Malayan personnel. The purpose of this visit was to evaluate the nutritional status of military and civilian populations throughout the country. Insofar as possible, samples were selected from all population strata, from representative geographic locations and from all races. It is realized that complete random selection can seldom be achieved, but every effort was made to strive toward this goal. A total of 8,172 examinations were conducted including 1,569 detailed examinations and 729 chemical determinations. In addition, detailed dietary histories were conducted, samples of fresh and cooked food were collected for analysis and expert evaluation of food and agricultural facilities was made.

All of these data were evaluated statistically and were correlated in order to form the basis of the present report. This attempts to define the methods which were used, to present the results obtained and to compare these results not only with Western countries, but also with neighboring countries in southeastern Asia. The report gives a factual evaluation of the growth and development of children, the state of physical health of adults including the occurrence of hypertensive vascular disease, obesity and diabetes, and it also delineates the adequacy or inadequacy of nutrition in terms of specific chemical components and vitamins and minerals. This information when coupled with the knowledge of available food supplies and customary food habits should enable the Malaysian government to correct any deficiencies which do exist. It is hoped that this report will be instrumental in aiding the Ministry of Health as well as the Ministry of Agriculture and other governmental agencies in future planning for the welfare of this progressive country.

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I

PURPOSE AND OBJECTIVES

Arrangements

At the request of the Malayan government the United States Interdepartmental Committee on Nutrition for National Defense (ICNND) sent a team of physicians, dentists, biochemists and specialists in food, nutrition and parasitology to Malaya in September 1962. The Malayan government organized a counterpart team which worked closely with the Americans to perform the survey. A biochemical laboratory was located in the Institute for Medical Research (IMR) in Kuala Lumpur and was fully equipped by the American team. A counterpart team worked with the American chemists and learned the procedures. Transportation was arranged by the Malayan government in land rovers, on trains and by air. The details of methods employed are listed in Chapter IV.

Acknowledgments

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Methods Employed

Briefly, the survey team employed the same technics which have been used in other countries surveyed by the ICNND. In the original plan an endeavor was made to balance as nearly as possible the numbers of examinees from city and rural areas as well as between military and civilian groups. An effort also was made, insofar as possible, to get representative samples of all three racial groups and to try to avoid an undue number of examinees in any given age group. Preliminary arrangements assisted greatly in striving toward these goals, but they were of course not fully achieved.

At each examination site, the help of local officials was enlisted in order to procure a suitable building for holding the survey and in order to notify the local populace of the purpose of the survey. Ideally, a certain percent of any population group should be selected at random for such a survey. This frequently was not possible and in some instances a very disproportionate sample had to be collected due to a misunderstanding on the part of local officials or due to unavailability of certain groups.

Each person to be examined was registered by a clerk, then weighed and measured. Following this he was sent through the abbreviated clinical examination line and thence either to the detailed examination or the dentist or the laboratory or he was released (see detailed description of procedures, Chapter IV).

II

ABBREVIATED SUMMARY AND RECOMMENDATIONS

Anemia and Iron

All children with hemoglobin levels less than 12 gm per 100 ml of blood cannot arbitrarily be considered anemic, but this seems a satisfactory value above which children almost certainly are not anemic (1).

Using this criterion of 12 gm of hemoglobin per 100 ml of blood or above as being normal for children and women, 36 percent of children less than 5 years of age, 13 percent of children ages 5-14 and 19 percent of all nonpregnant, nonlactating women and girls over age 15 were "anemic" (see Tables 65-67 and Appendix Table 45).

No specific recommendations are being made concerning correction of anemia in children primarily because the nature of this anemia cannot be determined by this study. It is certain that it represents a number of different causes including protein deficiency, inadequate dietary supplies of iron, infestation with parasites, and possibly a small number are due to sprue or other forms of malabsorption syndromes. Accordingly detailed clinical evaluation of a sufficient number of anemic children is needed to determine the frequency of the several causes involved.

Protein Nutrition

Although, on the average, protein nutrition seemed to be quite adequate, both in terms of the clinical examinations and the laboratory-determined values of blood proteins, there were significant exceptions, notably in children under age 5, 13 percent of whom were found to fall below the normal range for total plasma proteins. This indicates that special attention should be given to this group. Most of those who were deficient were Malays and Indians. The numbers of Chinese were too small for evaluation. Protein malnutrition was particularly evident in rural areas. Recommendations must be made concerning improvements in the protein nutrition of these youngsters. The current government programs of health and nutrition education at all levels and of distribution of skim milk to toddlers and expectant and nursing mothers in health centers are valuable contributions to such improvement.

It is recommended that fishing be expanded since this offers the greatest opportunity for increasing the supply of high quality protein. Realization of the potentials of deep sea fishing will require considerable investment in ships and supporting facilities. Equally important is an educational program in fishing and fishery technology, as advocated by the Fisheries Department, in order to provide the skilled personnel needed to operate the ships and facilities. Fresh water fisheries should be expanded as rapidly as technics can be effectively introduced in the inland areas. Fresh water fishing is particularly important for inland rural families whose ability to purchase sea fish is limited. It is noted that the Fisheries Department is now actively encouraging these developments.

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The generally adequate protein nutrition of the rest of the population is further verified by the diet survey and is substantiated by raw food analysis, both of which indicate adequate quantities of protein in the average diet. This is in contradiction to the earlier studies of the Institute of Medical Research (2), which indicated protein intakes on both the national and rural bases were deficient.

Goiter and Iodine

Although the prevalence of goiter is not at all alarming, it is to be noted that a material number of individuals in whom iodine excretion was measured fell within the "low" range of excretion values. Although it is believed that goiter is not a national problem, it is known that small pockets where it occurs do exist, and hence the government should explore the practicability of requiring that all imported table and cooking grade salt contain one part of iodine (as potassium iodate, KIO_3) to 20,000 parts of salt.

Thiamine and Riboflavin

Due to the fact that children excrete less creatinine in proportion to the metabolites of the B-vitamins (the reference used in measuring the status of these nutrients) a different set of references has been used for excretion rates of thiamine and riboflavin in children under 5 years of age (see Table 57). According to this reference, between 16.6 and 75 percent of these children were classified "low" or "deficient."

Urinary excretion rates of these two vitamins were low in subjects over 5 years of age. The rate of excretion of these two vitamins fell in the "low" or "deficient" range in from 20-80 percent of the individuals studied. Chemically lack of riboflavin seemed to be greater than lack of thiamine. Clinically there was very little evidence of deficiency of either vitamin, but by food surveys and dietary history, intakes of both vitamins were low, as was known prior to the study.

Accordingly we consider it necessary to recommend means whereby the intake of these two vitamins can be augmented for those population groups other than children and women attending Maternal and Child Health centers who receive thiamine prophylactically. Suggested methods for augmenting thiamine and riboflavin intake include:

. First and foremost, education of people in means of preserving those amounts of the vitamins which are already present in their food. Essentially this is a matter of avoiding the use of excess cooking water, prolonged cooking or storage of food under adverse conditions. Such education now given in Maternal and Child Health centers and in adult education activities of the Ministry of Rural Development should be continued and expanded.

Second, the excessive milling of rice must again be strongly criticized, although it is realized that these recommendations undoubtedly will not be accepted readily by most groups of people, since polished rice is universally preferred, except among rural Malays.

Third, the government might consider the use of vitamin-enriched rice, particularly in institutions and in the Army. This might be accomplished by use of a "premix" which is prepared by soaking cooked rice grains in a solution of thiamine and riboflavin (and other vitamins if necessary) and then adding these dried supplemented rice grains at a prescribed level to the family's supply of rice (see Appendix 1). Often this is one "premix" rice grain per 99 of regular rice. Although a "premix" was tried in 1955 and discarded because of local distaste for the product, this is still an acceptable means of enhancing intakes of riboflavin, thiamine and other nutrients.

Fourth, encouragement through education of the use of pulses, liver, milk, eggs and nuts such as ground nuts should be continued and enlarged. This would increase the intake of thiamine materially and would augment the intake of riboflavin particularly if liver, milk and eggs were included.

Fifth, because of the increasing use of wheat flour in the States of Malaysia it might be considered desirable to supplement or enrich flour with thiamine, riboflavin and iron. Alternatively, bread may be enriched by the addition of vitamin wafers to the dough in mixing. (Enriched bread is now in use in the Federation Armed Forces.)

Sixth, the States of Malaysia government might consider the production of yeast in a fashion similar to that which the Institute of Nutrition of Central America and Panama has introduced in the Central American countries. Small quantities of Torula yeast could be added to bread or curry or possibly to other foods, thus increasing the intake of both thiamine and riboflavin.

Also (seventh), yeast could be added to fish flour meal, which would be particularly advantageous when considering the apparent deficit of protein in the diet of children under the age of 5.

Pyridoxine and Niacin

Our evidence indicates that the supply of these two vitamins is adequate and that no changes need be made.

Ascorbic Acid

Although the chemical and food survey data would indicate that there are some marginal intakes of ascorbic acid, the general supply of this vitamin seems to be quite adequate. These results, as well as those on niacin mentioned immediately above, confirm findings of earlier studies carried out in Malaya.

Vitamin A and Carotene

Based upon values calculated from military rations, the vitamin A intake of military personnel seems to be fully adequate. In children below the age of 5 biochemical data indicate that vitamin A and carotene were "low" or "deficient" in 20-30 percent, bearing out earlier findings that vitamin A was seriously deficient in children. In children ages 5-14, 12-25 percent were

"low" or "deficient" in vitamin A and carotene, and in those above age 15 (civilians and dependents) the numbers who were "low" or "deficient" constituted 7-8 percent. Of much more importance, however, is the fact that in pregnant or lactating women the numbers "low" or "deficient" in vitamin A rose to 15 percent. This indicates that methods must be sought for augmenting the vitamin A intake of children under the age of 5 and of pregnant and lactating women.

Means for supplementing vitamin A intake are not entirely practical but the following might be considered:

First, increased use of leafy vegetables, squash and yellow cucurbits, and of those tree products which contain an abundance of vitamin A including papaya, mango and banana species.

Second, fortification of canned condensed milk and of margarine. (These two products are now becoming available for sale in Malaya.)

Third, the provision of powdered milk which contains stabilized vitamin A (the addition to the diet of milk or of eggs would increase not only the vitamin A and protein content but also to some extent would augment thiamine and would greatly add to the riboflavin intake).

Fourth, utilization of red palm oil. It is realized that this is at present an unpopular product, but it may be incorporated in margarine or used in other ways acceptable to the average Malayan. This proposal is now being considered by the government.

Vitamin D and Calcium

Because of the low observed incidence of rickets it is assumed that adequate amounts of vitamin D are probably manufactured by virtue of exposure to sunlight. On the other hand, by Western standards calcium intakes might be considered low, particularly in those localities where milk is not an item in the diet. Substantial quantities of calcium are furnished by the small fish, the bones of which are edible, but even with this source included the intake of calcium cannot be considered to be abundant in most civilian populations.

It would be desirable to augment the intake of calcium particularly for growing children and for pregnant and lactating women. The methods whereby this might be accomplished most easily would be the inclusion of either condensed or powdered milk in the diet. This also would improve protein, thiamine, riboflavin and vitamin A nutrition simultaneously. Another possible means of augmenting calcium intake is to add small quantities to the flour. This is already done in military messes. Increased use of fresh vegetables also would increase the intake of calcium.

Children Under 5

Children under the age of 5 years should be studied in greater detail since the most serious deficits of protein, vitamin A, thiamine and

riboflavin were evident in this age group. Unfortunately this age group was not well represented in the present survey, although it has been the main group studied at the IMR for a number of years.

Nutrition Education

In connection with the present program of the Ministry of Rural Development for home economics education for village level workers, traveling nutrition specialists should be given training to prepare them to visit villages once a year in order to instruct in purchase, preparation and service of food for proper nutritional value. Nutrition education at all levels should continue to be actively pursued.

Food and Agriculture

Development of the food and agriculture section of the economy is important in order to achieve an increase and diversification of the food supply and to raise the productivity of a large part of the Malaysian working force. The current activities of the Ministry of Agriculture in crop diversification are to be commended.

An Institute of Food Utilization and Technology to deal with storage, processing, packaging and distribution as well as training of technical personnel should be established. (Establishment of such an institute in collaboration with FAO is currently (1964) under discussion.) This should be in addition to the activities of the College of Agriculture at Serdang. Expansion of these activities could result in larger classes and greater promotion of animal husbandry. It is to be hoped that efforts to develop more production of citrus and other fruits will continue. Developments pertinent to this recommendation are discussed in Chapter V.

Fluorides

In view of the levels of decayed, missing, or filled teeth (DMF) in the States of Malaysia, it is recommended that fluoridation of public water supplies, known to be low in fluorides, be accomplished throughout Malaya at a level within accepted standards. As a complement to the fluoridation of public drinking water supplies, it is further recommended that in government dental clinics supplying dental services, particularly for school children, stannous fluoride regularly and consistently be applied topically to the teeth of all children in accordance with standard procedures currently acceptable in dental practice.

As a preventive measure in the control of periodontal disease, it is recommended that a vigorous educational program be accomplished in government dental clinics to teach oral hygiene procedures, consistent with the best dental practice.

Water Supplies

While the water supplies in most cities seem to be excellent there are still a great many rural communities which do not have potable water supplies, adequate sanitation, or suitable means of waste disposal. These of course fall under the province of public health measures rather than nutrition, but they have a material effect upon the state of nutrition of the individual and certainly these deficits are emphasized by the extremely high rate of parasitism discovered in this survey. It is gratifying to note that improvement of water supplies is part of the program of the Ministry of Rural Development.

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III

THE COUNTRY, ITS PEOPLE AND THEIR ECONOMY

At the time this survey was conducted in the fall of 1962, the Federation of Malaya occupied only the Malayan Peninsula and the island of Penang. This survey does not relate to the other countries which have since joined the States of Malaysia.

The Federation of Malaya is a tropical country lying between east 100-104° longitude and north 1-7° latitude (see Figure 1), approximately 200 miles wide by 380 miles in length. Many portions of the country are mountainous and there are dense jungles occupying large areas of the interior. Along the coasts where most of the cities are located the jungle has been cleared away for industrial and agricultural purposes. The total area of Malaya is slightly greater than 50,000 square miles, of which about 5 1/2 million acres are cultivated. About one million acres of this are devoted to rice and about 3 1/2 million to rubber. The rainfall, which is very heavy, particularly in the east coastal areas, creates a problem by washing away top soil and soluble nitrogenous substances from the alluvial and lateritic clays which constitute the base of the soil.

The Federation is populated by approximately 7 million people, 45.5 percent of whom live in urban areas. This population is made up of about 50 percent Malays, 40 percent Chinese and 10 percent Indians. The Chinese tend to congregate in the cities, whereas the Malays seem to prefer rural life.

The government was firmly established along British lines to provide a stable system of taxation which adequately finances federal enterprises. This constitutional government assures democratic processes, a well established legal procedure and favorable economic policies. The government as a result has been able to foster the building of excellent highways and railways, as well as to provide clean water supplies, general public health measures, a ministry of agriculture and many other federally supported policies which favor industrial development of the country.

The economy of Malaya has depended very heavily upon two products, rubber and tin, but there has been a strong effort to encourage agricultural and industrial diversification (Appendix Table 2). More details of the agricultural advances are included in Chapter V under food and agriculture.

Education has been one of the major forms of federal expenditure. Despite shortages of classrooms and teachers, the country has been able to provide six years of free schooling to all children. Secondary schools are being developed as rapidly as possible and an increasing number of students are obtaining higher education, including those who attend the University of Malaya at Petaling Jaya (see Appendix Table 3).

Instruction in the primary schools has been in Malay, Chinese or Indian languages, but there now is a determined effort to nationalize the Malayan language. Higher education still is conducted largely in the English language, although here also the Malayan language is being introduced.

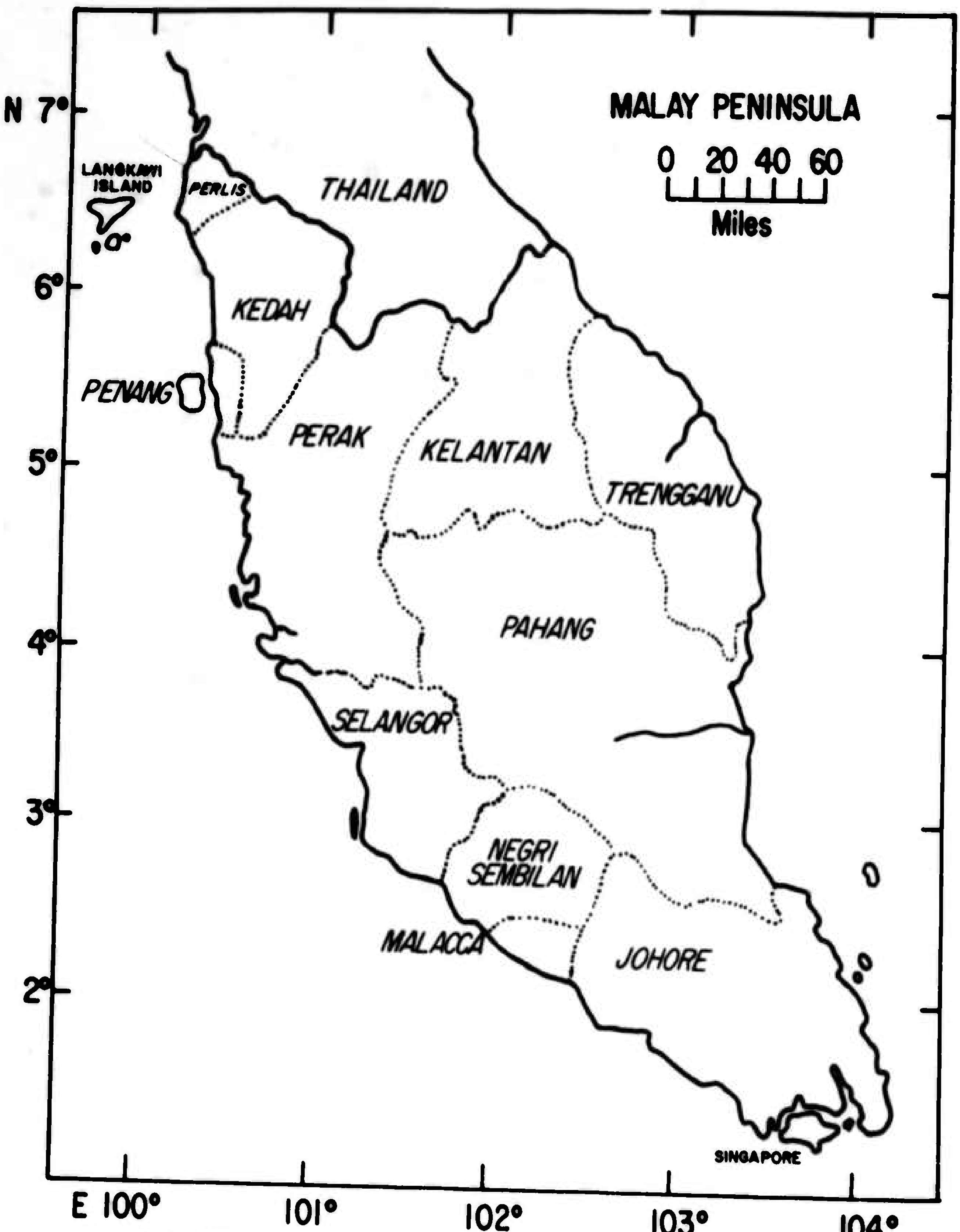

FIGURE I MAP OF MALAYA SHOWING STATES

The country is divided into 11 states, nine of which are governed by a Sultan, and two which have governors at their head. By vote, the 9 sultans choose a paramount ruler for a period of 5 years. The economy of the various states is roughly as follows: Johore is the southernmost state and has become highly commercialized, particularly in regard to growing and processing of pineapples. It also produces substantial quantities of rubber, coconut, palm oil, pepper and small quantities of rice (see Figure 4). The capital city, Johore Bahru, is a modern industrial center which lies directly across the channel from Singapore. In the Central Animal Husbandry station near Kluang, breeding experiments are being conducted in buffalo and cattle in order to produce animals suitable to the tropical climate. Nearby the Ayer Hitam agricultural experiment station is engaged in testing new crops, including many varieties of trees, manila hemp and other agricultural crops.

Negri Sembilan, which lies north and west of Johore, includes the town of Port Dickson. This state is occupied largely by rubber estates and rice growing fields.

Malacca lies between Negri Sembilan and Johore. Its capital city is the famous and busy town of Malacca. Rice growing in this vicinity has become a problem because of the development of extremely high acidity in the rice paddies surrounding the city. Rubber and rice constitute the principal crops of this state.

Selangor, which lies on the coast to the north of Negri Sembilan, contains the capital city of Kuala Lumpur with its seaport town of Port Swettenham. The capital city is a modern metropolis which houses not only the government buildings but many factories, hotels, banks and industries. The principal crops of this state are rice and rubber, but tin mining has been a very important industry for many years.

The state of Perak is on the west coast, north of Selangor and is the center of the tin mining industry. The town of Ipoh, which is largely inhabited by Chinese, devotes much of its activity to tin mining. In addition to the agricultural crops of rubber, rice and coconut, there also is some palm oil production. Efforts at raising oranges have been quite unsuccessful, but the fishing industry is flourishing.

The state of Penang includes not only the island of Penang but also Province Wellesley. The city of Georgetown (also known as Penang), on Penang Island, is a free port in some regards resembling Singapore. In addition to having a large metropolitan area with shops, industries, banks, hotels and warehouses, it is also a busy seaport.

To the north lies the state of Kedah, which, like the state of Perlis to the north of it, is occupied in growing paddy rice. A substantial amount of rubber is also raised in these two states.

The three states of Kelantan, Trengganu and Pahang occupy the northeastern half of the Federation of Malaya. Much of this region is mountainous with heavy jungles, particularly in the river valleys. Along the narrow

coastal plain fishing is the major occupation. In the highlands some vegetable crops such as cabbage, tomatoes, carrots and peas are raised on terraced hillsides, but agriculture is not so successful along the east coast as it is further west. (More details of crops and agricultural production are included in Chapter V.)

Clinics have been long established in Malaya but at the time of the survey they were being greatly extended by the government. Health workers include health nurses, government-trained midwives, health inspectors, sanitarians and others who work in rural areas. In addition, traveling dispensaries make regular routine visits to certain villages. Local practitioners of native medicine (bomoh) use a mixture of Malay, Chinese and Western medicine.

Observations of an anthropologist during the course of the survey indicated that the average diet of Malayans has little variety, although the three racial groups, Malay, Chinese and Indian, show pronounced differences in their diet patterns. The Hindu Indians adhere, according to caste, wholly or partly to vegetarian diets. Nevertheless, for all population groups one meal is much like the next; "breakfast" and "dinner" differ little except for the time at which they are served.

Rice is a staple for all population groups. Those who grow their own rice home-pound some of it. When rice must be purchased it is machine milled. Only the Indians use parboiled rice. The importance of rice in the diet of all Malayans is indicated by the large numbers of words in the language for rice of different states: for example, there is a word for rice that is planted, rice in the fields, rice after harvest, rice after hulling, rice after cooking. In addition there are at least six different kinds of rice, each of which has its own name. Despite this, a growing tendency toward the use of bread for the first meal of the day, occasionally with margarine and jam, was noted.

All Malayans use large quantities of hot, spicy condiments. In addition to hot, red or green peppers other spices are employed generously. Garlic and onions are used extensively. The Indians use curries. The powdered and dried spices of the Malays have a hot, salty taste. The Chinese make use of fresh ingredients such as leaves, flowers, seeds and roots in addition to dried spices. Malays, on the contrary, eat very little greens or other vegetables. Many of their meals consist of rice, fish and red peppers only. It appears that spices are considered foods rather than condiments.

Fish is consumed by all groups at frequent intervals. Fresh fish, most of it from the sea, is eaten frequently; salted and dried fish is consumed regularly. Prawns are often a part of the daily diet. Pork, fresh or dried, is eaten by Chinese at almost every meal. Since Malays are Moslems, they will not eat pork in any form but they do eat beef, mutton, buffalo and other meat. Malays and Indians as well as Chinese cut all meat into small pieces before cooking, usually in a spiced sauce. All three groups eat chicken, although generally it is served only on special occasions. Eggs are consumed infrequently and in very small amounts, since eggs are more apt to be sold.

Other pulses and grains are part of the Indian diet, and the Chinese and Malays frequently use soybeans. (See Appendices 36, 66, 67 and 69 for lists of commonly served foods and dishes.)

Many foods are fried in coconut oil. Some time ago attempts were made to introduce the use of red palm oil which has a very high vitamin A content. This oil has a strong taste and apparently even when mixed with coconut oil it is not very palatable. Furthermore its use is still associated with the Japanese occupation; hence it has not been found acceptable.

Although Malaya is a tropical country and fruits are readily grown, they are not usually eaten at meal time. Distribution and marketing are now widespread.

Menus for all three racial groups are very simple and the quantities of nonrice foods consumed are small indeed. The amounts of meats and vegetables served daily to a family in the United States would feed a Malay family for a week.

Most of the foods in the diet seem to be "soft." Vegetables are rarely eaten raw; those fruits which are consumed are all soft. In addition, the Chinese and the Malays are very fond of sugar; coffee and tea, regularly drunk by all ages, are heavily sweetened. These are factors which could contribute to poor dental health.

The simplicity of the diet may be due in large part to the fact that food distribution and marketing are inadequate by Western standards and the selection of foods in local markets is thus limited. Refrigeration is rarely available and thus food must be bought daily, or dried or otherwise preserved foods must be used. Imported packaged and canned food items are fairly generally available in Malaya as are locally produced and packaged items not native to the country. These, of course, are usually expensive items. The single most important imported food is canned, sweetened condensed milk. Its acceptance is probably based upon its sweetness rather than on perceived nutritional value. Dried milk was introduced into Malaya some years ago. Other milk products are being introduced, including a number of baby foods based on cereal and milk. The Chinese mothers seem to be the first ones thus far to use baby formulas. Malay mothers generally nurse their babies for at least a year, and then feed the infant rice gruel. Only the Indians drink fresh milk and use dairy products.

Young Malay children especially receive a very poor diet. Children, as a rule, are not given any "special" foods. Rice is the first food introduced in the young child's diet, often as early as 3 or 4 months after birth. Children of all ages often eat when they feel like it, what they want to eat and wherever they happen to be. It is not at all uncommon for children to eat most of their meals away from home. In Malaya everyday mealtimes and amounts are flexible. School lunch programs do not exist in Malaya today except in a few city schools through private charitable organizations.

In Chinese cooking a wide variety of foods may be combined in a single dish. The Malays, on the other hand, appear to have traditional prohibitions against certain foods for certain categories of people, although these appear to be decreasing at the present time. One of these is a taboo against giving fish (and sometimes eggs) to young children. The effect of this restriction upon the protein intake of the children is obvious.

Other taboos concern prohibition of certain behaviour and intake of certain foods for women during childbirth and the lying-in period. In its most extreme form confinement is just that: the woman must remain in a specially constructed house or hut where she may not be seen by others. She can eat no meat, fish, or fruit, and is allowed only certain kinds of vegetables. The newborn is not supposed to nurse until the fifth day. Younger and more educated people tend to have fewer of these prejudices.

Malay culture apparently values age over youth. In the affairs of the kampong or village groups, no man under 40 is admitted to the body of ruling elders. Similarly it is not at all uncommon to find older people who have "been given a child." This often means that the child cannot go to school or lead a very normal life otherwise. This is done for the benefit of the older person, rarely if ever for the benefit of the child.

An important factor in the food habits of almost all Malayans is the widespread belief that many foods have certain inherent qualities in addition to their food values or taste, called in English "heaty" and "cooling." These terms do not refer to temperature of the food as consumed nor to foods with a hot taste, such as red peppers. Instead they refer to the supposed effects on the body when eaten. "Heaty" food makes one's blood hot; "cooling" food makes one's blood chilly, cool. Hot blood, however, does not mean fever, nor does cool blood mean chills. The effect is purely subjective and apparently very individual, and people do not agree on what foods are heaty or cooling. Foods may be heaty to some people, neutral to others. Only a few foods are agreed upon by all as having a heaty or cooling effect. Both the Malays and the Chinese use these terms. It is possible that these are Chinese beliefs which have become part of the Malay concepts of health and disease.

The Malayan peninsula has had a number of important migrations. Some believe that the Polynesians, who have occupied the islands of the Pacific for perhaps two thousand years, came from or through Malaya. Common elements in Malayan and Polynesian language and cultures, as well as physical appearance of Malays (the Malays are physically Polynesian in type), tend to indicate this. Later waves of settlers came from the Indian peninsula and later still traders and settlers from Arabia. Although the western influence in Malaya is evident there is still much of the older Indian (Hindu) and Arabic (Moslem) influence.

Among the population groups those with the oldest continued residence are the Aborigines, numbering some 40,000. Most of them live in the jungle which still covers more than half of the land area of Malaya.

The Malays form the largest single population group in the country. Malay society is still basically feudal. Except for the government servants, an occupation filled by Malays for many years, there is no Malay middle class. Very few Malays make their living in the professions outside of government service.

The second largest group of the population is the Chinese who have lived in Malaya for centuries, but it is only during the last hundred years or so that they have immigrated to Malaya in large numbers. Economically the Chinese have "integrated" so well that they dominate the economy of the country. Socially their integration is much less marked.

The third major population group, the Indians, are the descendants of indentured laborers brought from southern India before World War II to work on the rubber estates. As in the case of the Chinese, until very recently their interests and ties were closer to their land of origin. Increasingly, Indians are now found in the professions and in other middle and upper middle class positions.

Malaya today is one of the most prosperous countries in Southeast Asia (see Appendix Tables 8 and 11 for economic data).

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IV

PROCEDURES AND METHODS

Food and Agriculture

The food and agriculture group was made up of one food scientist from Malaya and one from the United States. They carried out a general survey of food production, processing, transportation and marketing in the Federation of Malaya through visits, interviews and the collection of data. Meetings were arranged with government officials, businessmen, farmers, fishermen, educators, plant operators and research personnel. Visits were made to the following states: Johore, Malacca, Selangor, Trengganu, Perak, Pahang and Penang (see Figure 1).

Conferences with members of the Agriculture Department, the Fisheries Department and the Veterinary Department provided an over-all view of the food situation in Malaya and officials of these departments provided invaluable help in arranging an itinerary of visits throughout the Federation. During the survey the cooperation and efforts of field men from these departments made it possible to visit a large number and variety of locations.

The group visited agricultural and animal husbandry experiment stations, paddy areas, irrigation projects, fruit plantings, vegetable production areas, coconut and oil palm plantings and oil extraction facilities, sago and tapioca plants, peanut processing plants, etc. Calls were made at livestock farms and abattoirs. Fisheries and fishing villages on both coasts were visited. Included were trips to fishermen's cooperatives, fish processing facilities, hatcheries and research facilities. Schools conducted by the Fisheries, Agriculture and Veterinary Departments were viewed. All these visits and more were made possible by the assistance of field men from the various departments of the Ministry of Agriculture and Cooperatives.

Information on industrialization was obtained from the Industrial Development Division of the Ministry of Commerce and Industry. Visits were made to a can manufacturing plant, a fertilizer company, a dairy food manufacturer, biscuit factory, rice mills, canning plants, drug firm and other industries. Marketing practices and the use of credit were observed.

Calls were made at the College of Agriculture and at the Department of Agriculture of the University of Malaya in order to familiarize the group with higher education in the field of food and agriculture. Research facilities dealing with agriculture, animal husbandry and fisheries were visited throughout the Federation.

A considerable amount of factual information was obtained from publications of the various departments of the Ministry of Agriculture and Cooperatives and from the Statistics Department. Several yearbooks published by the Federation government and by newspapers also provided much data.

Statistical Plan

Insofar as possible the survey was conducted along the lines of the proposed statistical plan described in the ICNND Manual (1). In most instances a ratio of four to one was used in reference to the number of abbreviated clinical examinations as compared with the numbers of detailed examinations. The frequency of dental examinations varied, but usually constituted half or more of those given a detailed examination. Similarly a ratio of 4 to 1 was maintained between the numbers of detailed examinations and the number of laboratory examinations whenever possible. For example, for every 100 people registered 25 would undergo a detailed examination. Approximately 25 would have a dental examination and approximately one fourth of those receiving the detailed examination would have laboratory tests done. These arrangements were varied from one location to another whenever it was necessary in order to obtain appropriate sample sizes for laboratory or dental purposes. Samples for parasitologic examination were collected with a little less prearrangement but frequently all subjects undergoing laboratory tests also were asked to contribute samples of feces for parasitologic examination.

Clinical Sample

The clinical sample represented all those subjects who were registered and who underwent at least an abbreviated clinical examination. The following tables describe the groups examined:

TABLE 1. NUMBERS OF MILITARY AND CIVILIANS EXAMINED, MALAYA NUTRITION SURVEY

	Type of Examination			
	Clinical			
	Abbreviated	Detailed	Biochemical	Dental
Military	1,268	269	125	460
Civilians1/	5,408	1,300		2,483
Military Dependents1/	505		551	315
Pediatric Sample	943		53	222
Cards Discarded2/	48			
Total	8,172	1,569	729	3,480

1/ Total group over 5 years of age.
2/ Individuals registered but examinations not completed.

TABLE 2. NUMBERS EXAMINED BY AGE AND SEX, MALAYA NUTRITION SURVEY

	Type of Examination			
	Clinical			
	Abbreviated	Detailed	Biochemical	Dental
Military (All Males)	1,268	269	125	460
Civilian Male Children				
less than 15 years	1,794			704
Dependent Male Children		377	140	
5-14 years	54			31
Civilian Female Children				
5-14 years	1,439			637
Dependent Female Children		334	131	
5-14 years	65			40
Civilian Male Adults				
15+ years	949	203	106	543
Civilian Female Adults				
15+ years	1,226 1/			555
Dependent Female Adults		386 3/	174	
15+ years	386 2/			244
Total	7,181	1,569	676	3,214

1/ Includes [illegible] pregnant, 109 lactating.
2/ Includes [illegible]0 pregnant, 86 lactating.
3/ Includes 24 pregnant, 52 lactating.

Because of the likelihood that nutritional differences might be introduced by racial or religious background, the following tabulation was made. This involves only civilians and dependents:

TABLE 3. POPULATION EXAMINED BY RACIAL GROUP

Chinese	2,359
Malay	3,150
Indian	379
Other	3
Unknown	22
Total	5,913

From this tabulation it is apparent that the vast majority of those surveyed were Malay and Chinese. Tabulations by religion indicate that upwards of 98 percent of Chinese were Buddhist, 100 percent of Malays were Moslem and approximately 97 percent of Indians were Hindu.

In addition to the usual information on name, age, height and weight an estimate of the physical activity of each registrant was recorded, as was the state or location in which he had lived most of his life.

As mentioned previously the clinical examinations were conducted along conventional lines, with all registrants getting an abbreviated clinical examination, a portion of these undergoing a detailed examination and variable

numbers receiving dental and biochemical examinations. In addition, special examinations were performed by the parasitologists and a select number underwent screening studies for diabetes and evidence of coronary heart disease. The latter were not examined in any particular pattern, but were taken when facilities and suitable candidates were available at the same time.

As noted above, blood pressure was determined in all individuals over the age of six. This was for the purpose of determining the frequency and extent of hypertension and for comparison with urinary excretion of sodium chloride.

The blue pediatric cards were a source of frustration to most of the team members. These were not filled out in any consistent fashion and after numerous attempts at rationalizing differences in interpretation, the use of these cards was finally abandoned. The data that had been tabulated on these cards have been classified insofar as possible as abbreviated examinations, but there were some losses of cards as a result of this change-over.

Biochemical Sample

Samples of blood and urine were obtained by random selection from those individuals given detailed physical examinations (see Table 1). The sampling ratio varied from location to location in order to insure a work load of approximately 20-25 samples per day.

Hematocrit determinations were performed at the examination site. In addition, blood was introduced by means of a Sahli pipette into previously prepared vials of cyanmethemoglobin reagent. These vials were capped and returned to the laboratory where the contents were transferred to colorimeter tubes for determination of hemoglobin concentration.

About 10 ml of blood was collected by venipuncture into vacutainers containing 7 mg ethylene diamine tetraacetic acid as an anticoagulant. It was sometimes necessary to obtain lesser volumes when the subjects were women or children. An additional 10-12 ml of blood was drawn into heparinized tubes to provide plasma for special studies (amino acids, fatty acids, folic acid, etc.). Urine was collected in individual glass bottles containing sufficient 1.0 N hydrochloric acid (HCl) to achieve a pH of about 3.

All samples were stored in ice coolers and returned to the base laboratory, usually within 24 hours after collection. The plasma was removed from the blood samples following centrifugation and was used for the determination of total protein, albumin, globulin, vitamin A, carotene, vitamin C, cholesterol, lipid phosphorus and β-lipoproteins. The urine was filtered through Whatman No. 1 filter paper and portions were allocated for the determination of creatinine, thiamine, riboflavin and N'-methylnicotinamide. All of these determinations, except plasma cholesterol, lipid phosphorus and β-lipoproteins, were performed essentially as described in the ICNND Manual for Nutrition Surveys (1). Plasma cholesterol was determined by the method of Searcy and Bergquist (2), lipid phosphorus by the method of Fiske and Subbarow (3) and β-lipoproteins were determined by the BETA-L TEST™ using a commercial antiserum (generously supplied by Dr. T.M. Asher, Hyland Laboratories, Los Angeles, California, U.S.A.).

Excess plasma was transferred to ampules containing toluene as a preservative and ascorbic acid as an antioxidant. The ampules were then sealed and frozen. At the termination of the survey these samples were packed in dry i·e and shipped by air to the U.S. Army Medical Research and Nutrition Laboratory (USAMRNL) in Denver, Colorado, where they were subsequently analyzed for folic acid and vitamin B_{12} using microbiologic procedures, and for fatty acids by gas chromatography. When additional plasma was available, it was treated with 10 percent trichloroacetic acid and the free amino acid pattern was determined on the protein-free filtrate at the Denver laboratory. The results of these determinations are included in the Special Studies Chapter (X) of the report.

Surplus urine samples were acidified with 1.0 N HCl and stored in plastic bottles under a layer of toluene and returned to the United States at the end of the survey. One acidified aliquot was sent to the Boston Medical Laboratory for the determination of iodine content using a modification of the method of Zak et al. (4). A second portion was shipped to the USAMRNL for the estimation of oxalate by the method of Archer et al. (5), of magnesium by the ethylene diamine tetraacetic acid titration method of Robinson and Rathbun (6), and of sodium by flame photometry.

Approximately 210 urine samples were analyzed for free vitamin B_6 at the base laboratory using the Saccharomyces carlsbergensis microbiologic assay. Xanthurenic acid was measured in the urine of 90 subjects before and 6 hours after administration of a test load of DL-tryptophan, and 4-pyridoxic acid was also determined in the urine of 165 subjects. Details and results of these analyses will be found under the Special Studies Chapter (X), with the exception of those on magnesium, xanthurenic acid and 4-pyridoxic acid which will be presented elsewhere.

Dental Sample

Dental examinations in Malaya were conducted at all examination sites by two examining teams, one team composed of a Malay dentist and Malay dental nurse and the other composed of an American dentist and Malay dental nurse. The dental examinations were conducted in good natural light during middle daylight hours according to standard technics, described below:

1. Diseased, missing and filled teeth (DMF) were assessed according to the standards of Klein, Palmer and Knutson (7). This technic consists of the detection and computation of diseased (decayed), missing and filled deciduous and permanent teeth.

2. The degree and extent of periodontal disease (PI) were measured according to the classification of Russell (8). With this technic the periodontium was categorized as "0" if negative, "1" if there was noncircumscribing inflammation, "2" if the inflammation was circumscribing, "6" if there was inflammation with pocket formation and "8" if destruction of the periodontium had progressed so that the tooth was nonfunctional.

3. Attrition of molar teeth was determined by the method of McCombie (9).

4. Clinical fluorosis was estimated by the categories of Dean (10). The degree of clinical fluorosis was classified into 6 categories ranging from normal to questionable (or minimal), very mild, moderate, and severe.

5. The extent of debris and calculus and the oral hygiene index (OHI) were determined according to the criteria of Greene and Vermillion (11). Debris and calculus were scored separately in 6 representative areas of the teeth with values ranging from 1 to 3, the higher value indicating the most debris or calculus. OHI was calculated by adding together the mean values for debris and calculus.

6. Recession of the gingivae was recorded as the total number of teeth with the cemento-enamel junction visible above the gingival crest.

In addition, records were made of other oral abnormalities encountered such as leukoplakia, developmental anomalies, and malocclusion. Water samples were collected from 29 examination sites and composite urine samples were collected from 30 examination sites for analysis of fluoride content.

The classification and number of individuals receiving dental examinations in Malaya according to area of origin are shown in Table 4. Of 3,450 individuals receiving dental examinations, 2,562 were civilian males and females and 460 were military males. The civilians examined were 1,317 males, 1,245 females, and 102 male and 326 female dependents of military personnel. The smallest number of either military or civilian personnel examined originated from Trengganu, the sample from other states being fairly evenly distributed. The military personnel examined were predominantly in the 20 to 24 year age group with progressively lesser numbers in the age groups 25 to 29 years, 30 to 34 years, and 15 to 19 years (Figure 2). Only a few individuals were in the 35 to 39 and 40 to 44 year age groups. The civilians given dental examinations were fairly evenly divided as to males and females (Figure 3). The largest number of civilians were those 5 to 14 and those over 50 years of age, the remaining age groups generally containing between 100 and 200 individuals.

TABLE 4. CLASSIFICATION AND NUMBER OF INDIVIDUALS RECEIVING DENTAL EXAMINATIONS IN THE FEDERATION OF MALAYA ACCORDING TO AREA OF ORIGIN

Area of Origin by Region	Military Males	Civilians: Military Dependents Male	Civilians: Military Dependents Female	Civilians: Males	Civilians: Females	Total Civilians	Total per Area of Origin
Selangor	44	5	17	226	197	423	489
Kelantan	21	8	27	146	148	294	350
Pahang	14	1	12	146	170	316	343
Johore	66	4	19	178	128	306	395
Malacca/Negri Sembilan	133	40	97	128	98	226	496
Perak	106	27	102	225	235	460	695
Kedah	40	9	21	191	150	341	411
Trengganu	9	1	5	3	1	4	19
Penang	19	1	9	5	10	15	44
All others	8	6	17	69	108	177	208
Total	460	102	326	1,317	1,245	2,562	3,450

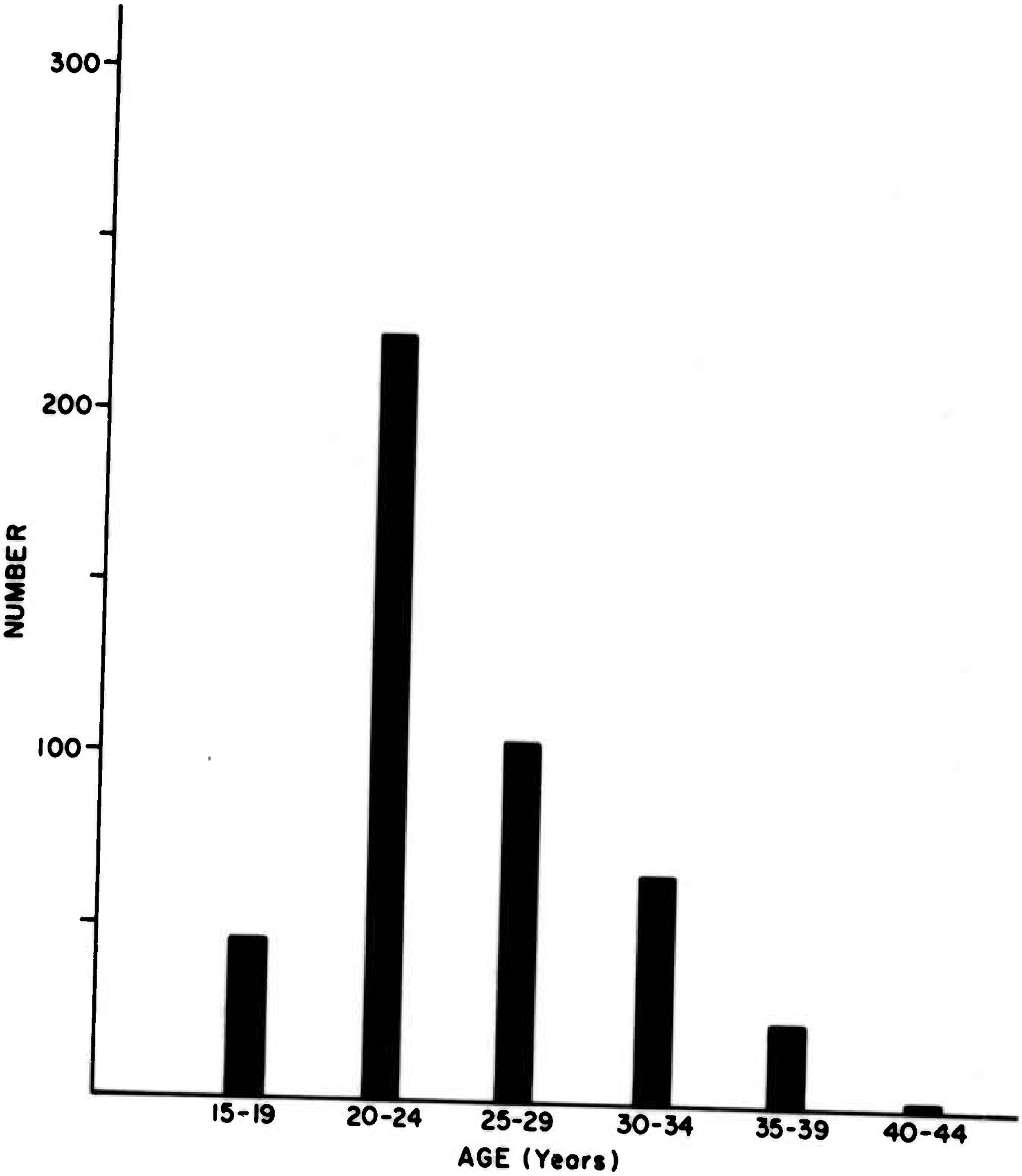

FIGURE 2. AGE DISTRIBUTION OF MILITARY MALES RECEIVING DENTAL EXAMINATIONS, FEDERATION OF MALAYA, 1962

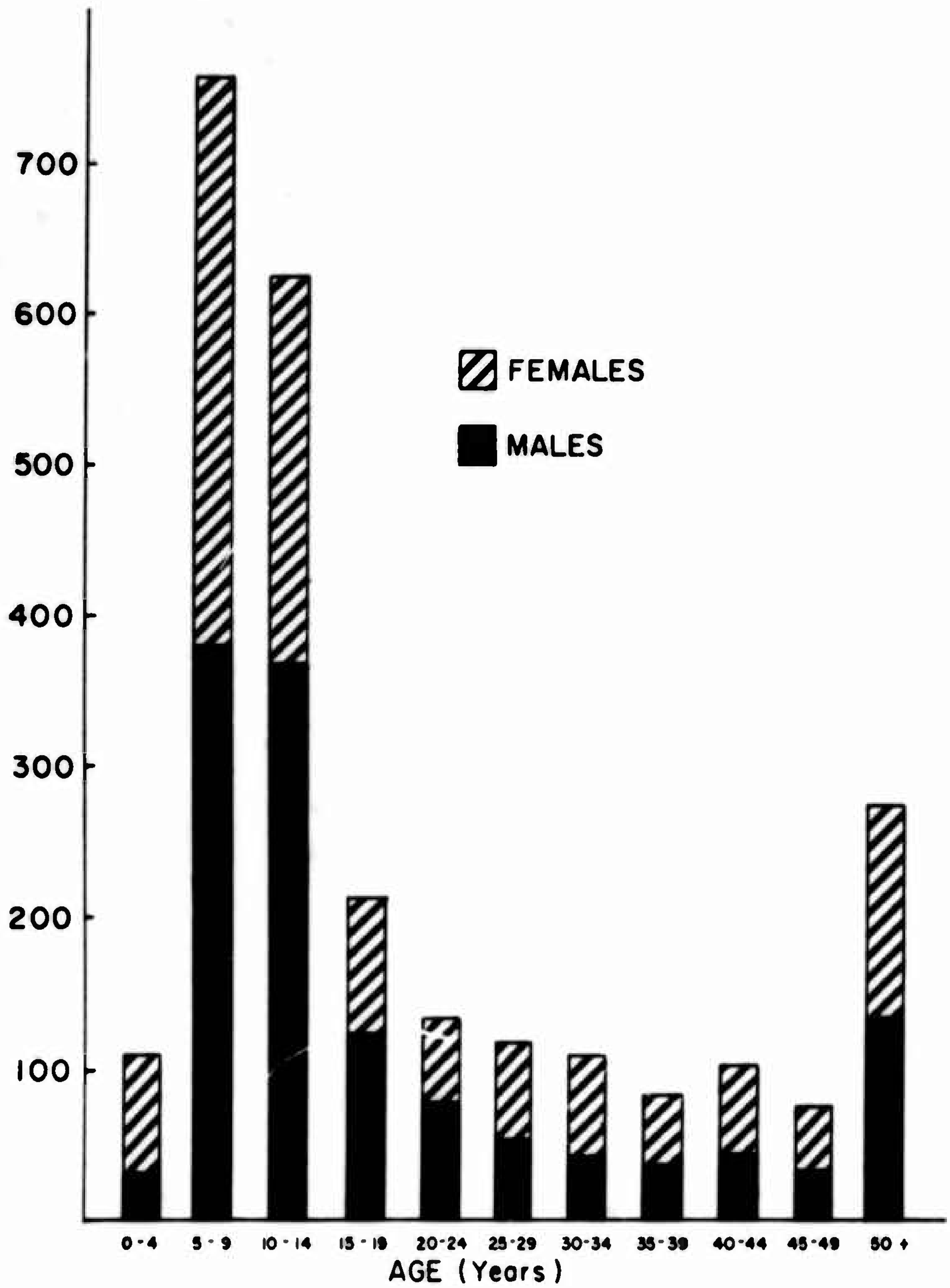

FIGURE 3. AGE AND SEX DISTRIBUTIONS OF CIVILIANS RECEIVING DENTAL EXAMINATIONS, FEDERATION OF MALAYA, 1962

Dietary Sample

Military

The military sample for the dietary survey included most of the military individuals examined in the clinical and biochemical survey. Only units from the Federation Army were included in this sample (Table 5).

TABLE 5. MILITARY POPULATION STUDIED IN DIETARY SURVEY, MALAYA

Unit	Average Daily Messing Strength
Bn A RMR[1/]	50
Bn B RMR	98
Bn C RMR	210
Bn D RMR	155
Bn E RMR	85
RECCE (Federation Reconnaisance Corps)	249

1/ Royal Malay Regiment.

Recipe Method

The standard recipe procedure as outlined in the ICNND Manual (1) was employed. This involved determining the quantity of food consumed by the individual soldier by calculating the amount of raw food prepared for each individual food item. The nutrients of the foods consumed were calculated using appropriate food composition tables (12-17 and Appendix Table 4).

Food Composite Analysis Method

The individual intake of the various prepared foods was determined by weighing the actual amounts of food to be consumed and counting the number of troops at a given meal. It was necessary also to ascertain the overprepared food as well as plate waste. Representative portions of the food as served were selected and blended if necessary to insure homogeneity. Following each meal composites were prepared proportional to the actual food intake. These composites were preserved with either oxalic acid (25 gm per sample) or 1 percent alcoholic potassium hydroxide (80 gm per sample) and chloroform (15 gm per sample). The final composite in each case represented one tenth of the food consumed per individual per day. The composites were prepared in two different ways in order to insure the preservation of all nutrients during shipment to the United States where they were analyzed by the Wisconsin Alumni Research Foundation. The methods of analysis used for the various nutrients are shown in Table 6.

TABLE 6. METHODS OF ASSAY USED IN FOOD ANALYSIS

Moisture:	A.O.A.C.[1/], p. 238, 9th ed., 1960
Ash:	A.O.A.C., p. 284, 9th ed., 1960
Ether extract:	A.O.A.C., p. 287, 9th ed., 1960
Protein:	A.O.A.C., p. 12, 9th ed., 1960
Fiber:	A.O.A.C., p. 288, 9th ed., 1960
Carbohydrate:	By difference
Calories:	By calculation
Calcium:	Ingols, R.S., and Murray, P.E., Anal. Chem. 21, 525, 1949
Iron:	A.O.A.C., p. 159, 9th ed., 1960
Sodium as NaCl:	A.O.A.C., p. 76, 9th ed., 1960
Phosphorus:	Fiske, C.H., and Subbarow, Y., J. Biol. Chem. 66, 375, 1925
Vitamin B_1 (thiamine)	A.O.A.C., p. 655, 9th ed., 1960
Vitamin C:	Roe, J.H., and Kuether, C.A., J. Biol. Chem. 147, 399, 1943
Carotene:	Moore, L.A., and Ely, R., Ind. Eng. Chem., Anal. Ed. 13, 600, 1941
Vitamin A:	A.O.A.C., p. 652, 9th ed., 1960
Vitamin B_6:	Atkin, L., Schultz, A.S., Williams, W.L., and Frey, C.N., Ind. Eng. Chem., Anal. Ed. 15, 141, 1943 (S. carlsbergensis)
Folic acid:	A.O.A.C., p. 830, 8th ed., 1955
Pantothenic acid:	Neilands, J.B., and Strong F.M., Arch. Biochem. 19, 287, 1948
Vitamin B_{12}:	U.S. Pharmacopoeia XVI, 888, 1960
Niacin:	A.O.A.C., p. 667, 9th ed., 1960
Riboflavin:	A.O.A.C., p. 669, 9th ed., 1960

1/ American Association of Agricultural Chemists.

Military Dependents and Civilians

Families of military dependents and of the three races, Malay, Chinese and Tamil (Indian), in the civilian population were surveyed in order to estimate the kinds and amounts of food eaten and to calculate nutrient intakes. Dietary attitudes and food customs, food preparation and cooking methods, marketing and availability of food were also studied (see Appendix 5). An attempt was made to select a representative sample from within each group studied by the clinical members of the team. In the kampongs (small villages), urban areas and among the military dependents, housewives were included in the dietary sample. In addition, a sample of school children was studied. The total dietary sample consisted of 87 military dependent families (367 persons), 132 civilian families (836 persons) and 372 school children (see Tables 80, 81 and 88). Of the 132 civilian families, 107 were studied by the questionnaire method and 25 were chosen for detailed home dietary study (by the recipe and food composite analysis procedures). The sampling was done so as to include families of rubber tappers, paddy planters, tin miners and fishermen. Only those families with toddlers (children aged 1-5 years) were selected for the detailed home dietary study. The kampongs and urban centers visited, and a summary of the number of families of each race, Malay, Chinese and Tamil, included in the dietary sample are given in Tables 7 and 8.

TABLE 7. LOCATIONS OF FAMILIES STUDIED BY DIETARY QUESTIONNAIRE, MALAYA

State	Military Dependents No. families interviewed	Civilians Kampong (K.) or center	No. families interviewed	Race
Perak	18	K. Beichang	7	Chinese
		K. Tambun	6	Chinese
		K. Ampong Bharu	4	Chinese
		K. Pusing	4	Chinese
		K. Jelapang	3	Chinese
Selangor	13	Kuala Lumpur, Sulieman Center	9	Chinese
		Bukit Bunggsar Labour Lines	9	Malay and Tamil
		K. Bharu	7	Malay
Malacca	12	K. Tanjong Kling	12	Malay
		K. Kesang Tua	3	Malay
		K. Jasin	5	Malay
Kedah	9	K. Gunong	2	Malay
Pahang	4	K. Tanjong Kreyong	6	Malay
Kelantan	14	K. Tebing Tinggi	1	Malay
		K. Mulong	4	Malay
		K. Melor	6	Malay
Johore	11	Sri Lallang	3	Chinese
		Kluang Town Council	6	Chinese
		Mengkibal rubber estate	2	Tamil
		K. Melayu (Kluang)	8	Malay
Negri Sembilan	6		—	
Total	87		107	

Three methods were used to determine food intakes in the military dependent and civilian population:

Questionnaire Method

Three interviewers, two members of the Malayan counterpart team and one member of the U.S. team, carried out the questionnaire study. The questionnaire used was a modified form developed by Lady Thomson at the Institute for Medical Research for her nutrition studies in Malaya (Appendix 6), designed to obtain information on a 24-hour recall basis of food eaten by the family. Some dietary interviews were conducted at the time of the clinical examinations and some were conducted in the kampong houses. The advantages of the home visit for the questionnaire procedure are obvious. The military dependent population was studied by the questionnaire method only.

Recipe Method

Twenty-five civilian families were selected for the detailed dietary intake study in the home. All the food prepared and eaten for a 24-hour (3 meal)

TABLE 8. LOCATION OF KAMPONGS SELECTED FOR HOME VISITS FOR DIETARY STUDY, CIVILIANS, MALAYA
(Food Composite Analysis and Recipe Methods)

State	Kampong (K.)	No. Families	Race
Kelantan	K. Saba (Pentai Desar)	2	Malay
Pahang	K. Tanjong Kreyong	3	Malay
Johore	K. Paya	4	Malay
Malacca	K. Solok Musai	1	Malay
	K. Kalan Batu	1	
	K. Paya Ikan	2	
Perak	K. Tambun	8	Malay
Kedah	K. Bukit Pinang	2	Malay
	K. Teloh	2	

period was weighed. The amount of food nutrients consumed per individual was then calculated using food tables and other sources (12-24), and these values were converted to the "standard man" unit (see Appendix Table 7).

Food Composite Analysis Method

Foods representative of those items found in each of the 25 homes visited were purchased from the market and prepared by a local woman in the manner that was the custom in the area. Composites of the food were then made in accordance with the weights of these items as measured in the homes, by taking a homogenized sample representing a certain percentage of the foods actually consumed by the family. Preparation and analysis of these composite samples were carried out in a manner similar to that for the military food composites and the intake per "standard man" unit was determined.

All food intakes for the dietary survey have been converted to a "standard man" value, using a requirement scale that gives a "standard man" a value of one.

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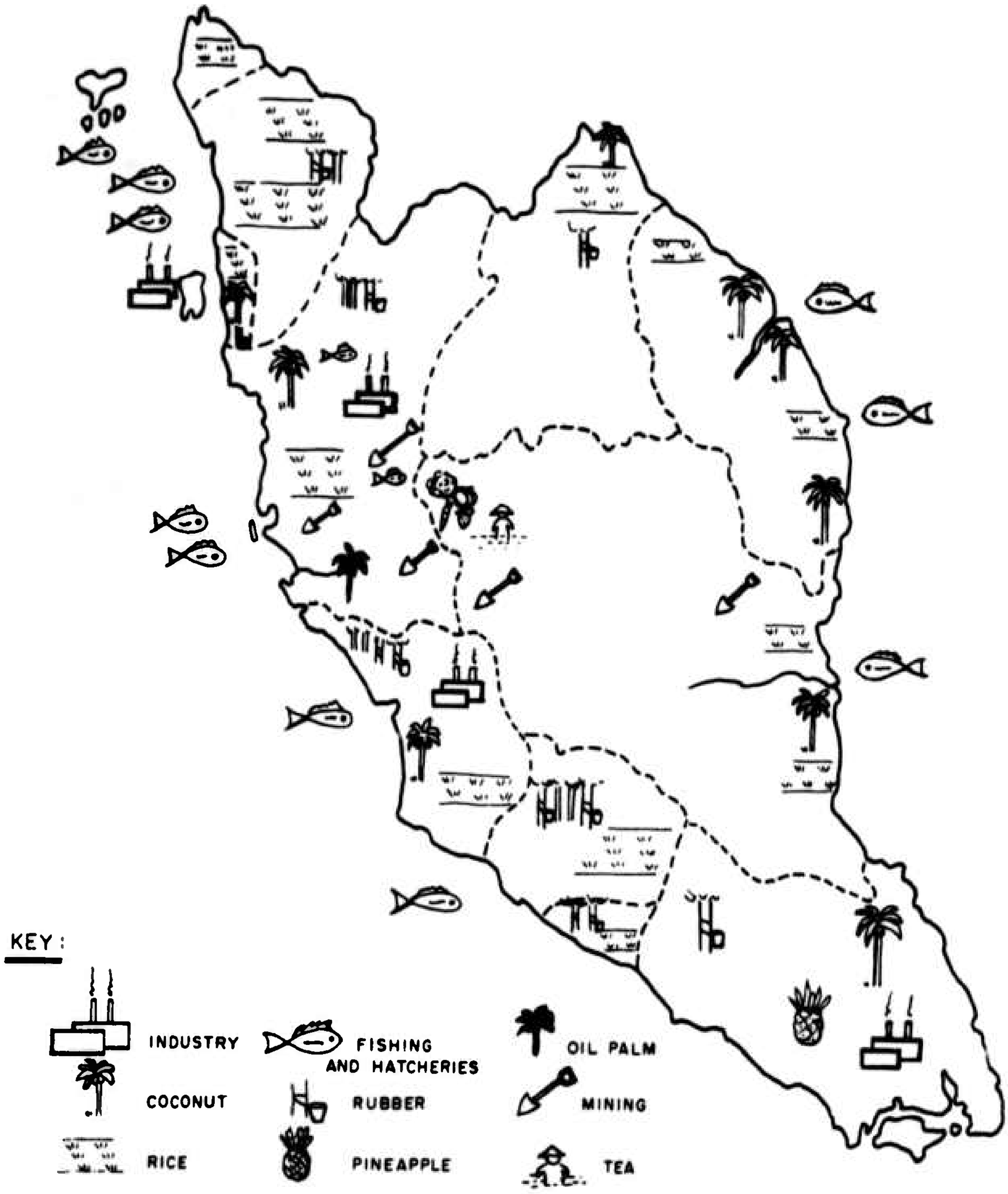
FIGURE 4. AGRICULTURE AND INDUSTRY, FEDERATION OF MALAYA



V

FOOD AND AGRICULTURE IN THE FEDERATION OF MALAYA

Most of the arable land of Malaya is occupied by rubber, coconut and oil palm estates (Figure 4). Paddy, the main food crop, is grown chiefly on small holdings. Fish is the principal source of animal protein. Rice milling is the largest food processing industry. There are also many small food processing establishments such as bakeries and vermicelli factories. A highly developed pineapple canning industry produces good quality pineapple for export.

Government revenues derive largely from export duties on rubber and tin (Appendix Table 8). In 1961, the Federation had a favorable balance of trade amounting to M $ 394,000,000.1/ The balance has been on the positive side for over a decade. The currency is stable and the cost of living index has remained steady for the past seven years. Per capita income was approximately M $ 825 a year in 1957.

Railways and trucks carry the main share of transportation between towns (see Appendix Table 9). Trucks, bicycles, ox carts and people carry produce from the farms to the towns and processing centers. Some coastwise shipping is used, particularly for fish.

The central part of the Malay peninsula is so mountainous that only one road goes from east to west. The east coast bears the brunt of the winter monsoon, while the mountains protect the west coast. There is much more arable land on the west coast. These factors have made the west coast more favorable for development. This condition is likely to continue until shortages of land in the west make it necessary to expand to the east. Even the great potential fishery of the South China Sea will probably be exploited by large ships from Singapore rather than by east coast fishermen.

Agricultural education is provided at several levels. A university degree in general agriculture is provided by the Faculty of Agriculture of the University of Malaya (see Appendix Table 3). The College of Agriculture at Serdang offers a diploma course in agriculture stressing practical work. At a lower level a 17-month program conducted by College of Agriculture graduates is given to young people who have completed secondary school. Numerous short courses for rural people are provided at experiment stations throughout the country.

Fishery education is provided at two schools, at Sebrang Takis and Glugor. At Sebrang Takis, near Kuala Trengganu, a 3-month course is offered, and at Glugor, on Penang Island, 10 months of instruction are given. There are no schools for veterinary officers within Malaya, but courses for the training of junior officers are offered at the Central Animal Husbandry Station.

Malaya has a number of active cooperatives, among which are farmers', fishermen's, milling, marketing, and credit cooperatives. These cooperatives have been quite effective, and are strongly encouraged at all levels.

1/ $ M 3 = $ U.S. 1.

Land tenure in Malaya is diverse. Throughout most of the country, except for freehold land in Malacca and Penang, the land is owned by the state or Sultan and is leased for long terms to individuals or companies. Some estate companies may have thousands of acres in one state; some small holders may have less than an acre. The lessee pays annual rent. He may also pay an initial premium, both depending to some extent on the use to which the land is put. The holder of the leased land may rent it in turn. Paddy land has the lowest rent (M $ 1/acre) and often no premium. Share cropping is prevalent in paddy areas. Here the land is rented on an equal share basis. The share cropper provides the seed, labor and fertilizer, and the landlord gets half of the threshed crop. Steps are being taken to modify this traditional share crop practice to enable the renter to pay a fixed cash rent for the land.

The Second Five-Year plan of the Malayan government proposes a major effort for further development of agriculture. Drainage and irrigation of an estimated 300,000 acres is intended to expand the national output of rice and other foodstuffs. Coconut rehabilitation and planting will be assisted by an allocation of M $ 15,000,000. The livestock industry will be expanded by improvement in the quality of livestock, development of grazing areas and the establishment of an Animal Production Institute. Fisheries development will also be aided. The Federal Land Development Authority has a goal of clearing, settling and cultivating an additional 250,000 acres of land. It plans to establish 12 developments each year, each one made up of about 400 families holding 10 acres each. Further land will be made available to the landless through the Group Settlement Act.

Crops

Rubber

Rubber occupies the largest planted acreage in the Federation (Appendix Table 10). Although it is not a food crop, it provides much of the foreign exchange that makes possible the importation of foodstuffs (Appendix Table 11). Production in 1961 was 738,000 tons. Fifty-eight percent of the production was from estates and 42 percent from small holdings. Since rubber is such an important part of the economy, vigorous efforts are being made to insure the viability of the industry and its ability to compete with synthetic rubber. Since rubber trees must grow about seven years before they are ready for tapping, and the average economic life of a tree is 25 years, replanting is a continuous process. In order to promote regular replanting and to insure that it is done with improved high-yielding strains of rubber trees, a replanting allowance of up to M $ 600 per acre is provided for those who comply with government specifications. Some of the new high-yielding strains are estimated to be capable of producing 1,500 to 2,000 pounds of rubber per acre.

Besides the development of high-yielding stock, the rubber research groups, such as the Rubber Research Institute of Malaya and the Natural Rubber Producers Research Association, have developed fertilization schedules and tapping procedures to maximize latex production. Work done on processing has also enabled the production of high quality crude rubber of various grades and characteristics so that the natural product can meet the specifications of rubber manufacturers.

Rice

Rice is by far the most important food crop in Malaya (see Figures 5, 6 and 7 and Appendix Tables 12 and 13). In 1961 there were an estimated 925,000 tons of rice available from production and importation, providing about 0.72 pounds of rice per person per day (Table 9).

TABLE 9. APPROXIMATE FOOD BALANCE SHEET, FEDERATION OF MALAYA, 1961 1/, 2/

	Production	Net Imports	Nutrients per capita per year 3/ Protein	Calories
	Million lbs/year		gm	
Meat	66	22	852	14,200
Milk	44	300	741	12,300
Fats (coconut, peanut oils, tallow)	174	-29		80,900
Fish (sea)	300	-44	2,440	18,700
Fish (fresh water)	50		475	3,650
Poultry (chicken, ducks)	41	4	380	5,600
Eggs	28	15	457	5,560
Sugar (sucrose)		400		97,600
Rice	1,355	705	8,850	468,000
Wheat (grain, flour)		290	1,860	63,500
Maize		72	410	16,150
Peanuts	4	20	245	5,300
Soybeans		30	714	6,720
Other dry legumes (mung beans, gram)		50	762	10,800
Potatoes (*Solanum*)		40	54	2,250
Sweet potatoes, yams	53		60	3,980
Other vegetables (long beans, onion, cabbage, mustard)	430		410	8,250
Total per capita per year			18,710	823,460
Total per capita per day			51	2,250

1/ This table does not include tapioca, fruits, wild game.
2/ See references (1, 4, 9, 12).
3/ Based on an estimated population of 7,200,000.

Approximately one third of the rice was imported, principally long-grained rice from Thailand. The main paddy growing areas are in Kedah, Perlis, Kelantan and Province Wellesley (Appendix Table 12). Most of the rice appearing on the market is highly milled, although 16,256 tons of parboiled rice were available through imports. Of the rice grown in the Federation 45 percent (about 275,510 tons) was milled by 79 large rice mills located mainly in the production areas. The bulk of the remaining local production was milled in small mills driven by gasoline or diesel engines and generally used at the village level.

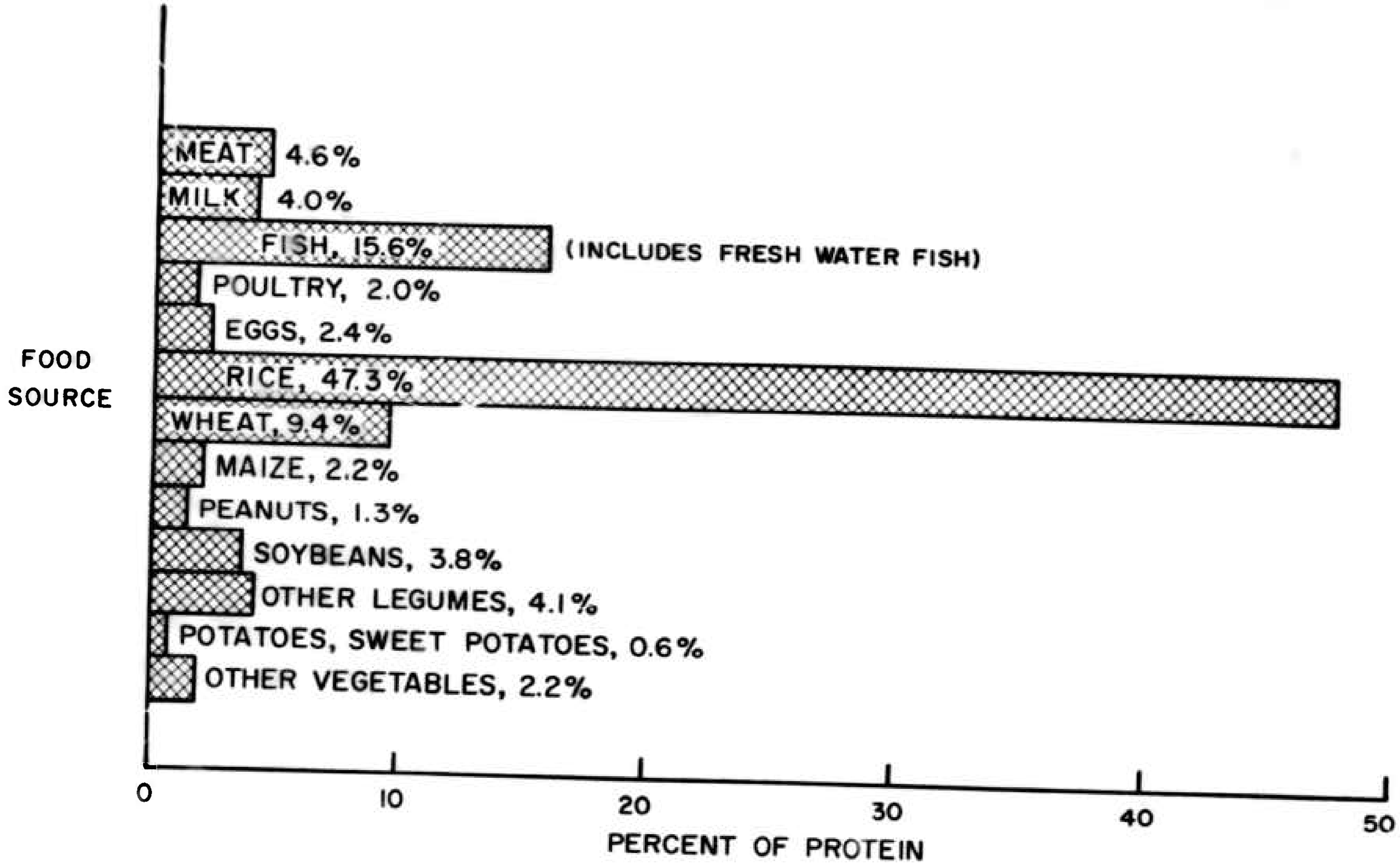


FIGURE 5. PER CENT OF PROTEIN FROM VARIOUS FOODS IN AVAILABLE FOOD SUPPLY, MALAYA, 1961 1/

1/ THESE FIGURES DO NOT INCLUDE FRUITS, WILD GAME

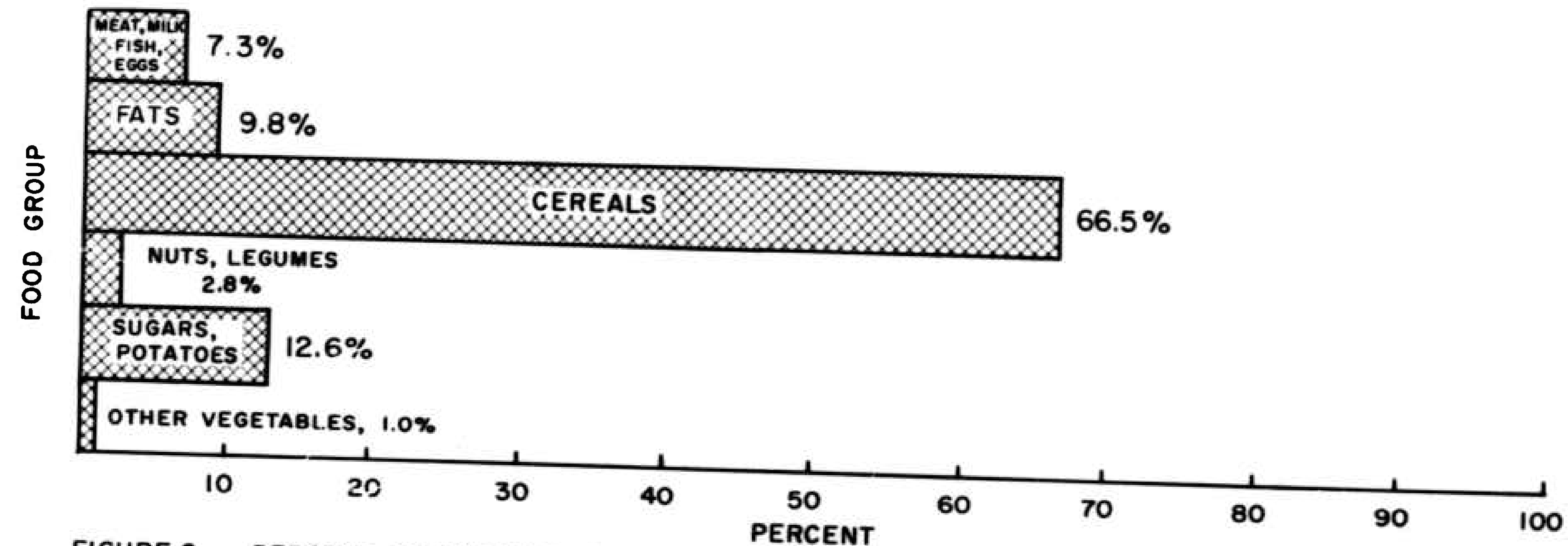


FIGURE 6. PERCENT OF CALORIES FROM AVAILABLE FOOD SUPPLY, BY FOOD GROUPS, MALAYA

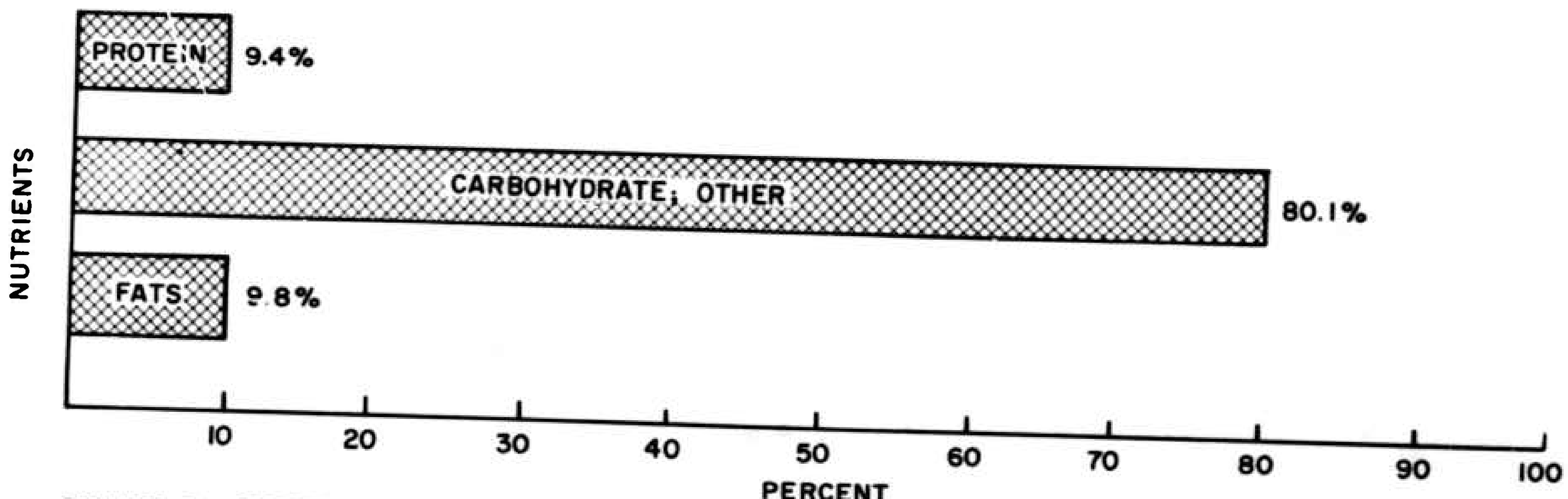


FIGURE 7. PERCENT OF CALORIES FROM AVAILABLE FOOD SUPPLY, BY NUTRIENTS, MALAYA

In milling, 30 to 40 percent of the weight of the paddy is lost as husks and bran. In the large mills the husks and bran are removed separately. The bran serves as a valuable feedstuff for livestock, selling for around M $ 11 a picul (133 pounds). The small mills are only slightly less efficient than the large mills but produce more broken rice. They also produce a ground mixture of bran and husks as a by-product which, because of its high fiber content, is limited in its usefulness as animal feed and consequently sells for M $ 3 to 4 a picul. The low grade feedstuffs produced by the small mills represent a considerable loss to the livestock economy of the country.

Both wet and dry paddy are grown in Malaya, but the bulk of the production (96 to 97 percent) is from wet paddy. Nine hundred thirty-one thousand acres were devoted to paddy in 1961. The average yield in 1960-61 was 2,080 pounds of paddy per acre which milled into 1,310 pounds of rice (63 percent recovery). Paddy yields were the highest in South Asia.

The wet paddy is produced on flat lowlands, plains and valleys where flooding is achieved largely as a result of heavy rains during the monsoon. Some artificial flooding is often needed during the early stages of growth. No elaborate terracing systems were seen in Malaya. The paddy is commonly planted in the fall and harvested in the spring. In some areas, such as the Kuala Muda River district, irrigation makes possible two crops a year.

The usual source of seed is superior heads of paddy saved by the farmer. Seed is often sown thickly in nursery plots. When the plants are about 40 days old they are transplanted to the paddy fields which are usually much less than one acre in size. Fields are kept flooded. Usually two weedings are necessary. The first may be undertaken a month after transplanting. The paddy is harvested by hand, usually by women, one stalk or head at a time. Harvesting may take several weeks. The paddy is stored as such on the farms since the husks provide some protection against insects and microorganisms. Rice for the farmer and his family is milled from his own paddy by the small mills which operate on a fee basis.

Most of the paddy grown produces a short plump grain commonly referred to as Kedah rice. In areas of Selangor a long-grained type is produced which is similar to but smaller than the Thai rice. Long-grain rice is preferred in urban areas and is often priced 15 to 25 percent higher than Kedah rice (see Appendix Table 14). There is an extensive rice variety testing program under way at Paddy Experiment Stations throughout the country. The aim of the program is to investigate higher yielding, pest-resistant types, and quicker maturing varieties that will be compatible with two-crop systems. Taiwan-type paddy is now often used as a quick maturing variety.

Irrigation is being expanded as a means of increasing the country's paddy production. Recent schemes have been developed along the Perak and Trengganu Rivers. Irrigation has been successful, but required the introduction of faster maturing varieties, quicker harvesting procedures, and an alternate source of livestock pasture to replace the use of fallow paddy fields.

The government has done much to encourage increased paddy production through irrigation schemes, use of fertilizers, and other extension programs. Government action also maintains the price of Kedah rice at M $ .25 to .27 a catty (or kati; 1-1/3 pounds; see Appendix 15 for a glossary of Malay terms). This support price is eventually paid by importers who must purchase a certain variable amount of Kedah rice at the government fixed price in order to obtain licenses to import rice. Since the principal market for rice is the urban areas where the long-grained Thai-type rice is preferred, the importer has considerable difficulty in disposing of his allotment of local rice. At times he sells Kedah rice at lower prices than he has paid for it. Such losses are made up by increases in the price at which he will sell his imported rice. The consumer of long-grained imported rice thus pays a somewhat higher price for his rice in order to subsidize the local rice farmer.

Coconut (Cocos nucifera)

Following rubber and rice, coconut covers the largest area, 520,000 acres (see Appendix Table 10). Over half is under small holdings. Coconut is a major item of food in Malaya, but the bulk of the crop is grown for oil. Although grown everywhere, the main concentration of this crop is along the east and west coasts. The area best suited to it is the heavy alluvial clay of the west coast. On the east coast coconuts are grown along a coastal sandy ridge of low fertility where growth and production are less satisfactory (see Figure 4). Coconut productivity therefore varies from area to area. Average production in 1961 was 700 pounds of copra per acre. Under good drainage and management, yields of 1,600 to 2,000 pounds of copra per acre containing about 50 percent oil are obtained. Remarkably high yields, up to 2,600 to 3,300 pounds per acre, have been obtained with special strains of trees. The main harvest is in July, although nuts become ripe the year round.

While yields on the more progressive estates indicate considerable promise for the future of coconut, the estate owner as well as the small holder needs more information as to varieties, cultural practices and control of pests.

Toddy production from coconut palm sap is a widespread minor industry under close government control. A small amount of coconut palm sugar (gula Malacca) is also produced annually.

Oil Palm (Elaeis guineensis Jacq.)

This crop has been relatively recently introduced into the country, and has proved ideally suited to the local conditions, producing yields which are among the highest obtained in the world. Under proper management 2,000 pounds of red palm oil plus 200 pounds of kernel oil can be obtained per acre. The crop is, at present, grown mainly on large plantations. This has occurred because of the high capital cost of the oil-extracting equipment and the belief, perhaps exaggerated, that the fruit bunches must be processed very soon after they are removed from the trees. Participation in this industry by small holders is being brought about through government-sponsored land development programs. The areas under oil palm are largely on the west coast.

The palm is similar to the coconut in appearance, but has a thicker and more perpendicular trunk. Trees begin to yield at about 4 years of age and reach a maximum production at 10 years. The fruit is borne in bunches in the

leaf axils, an average bunch weighing 30 pounds. Each bunch contains 50 or more fruits the size of a large date. The outer part of the fruit is a fleshy, oily, fibrous pulp which yields the red palm oil. The pulp surrounds a nut from which kernel oil is obtained. Oil palms require free drainage together with a plentiful supply of water. Installation of drains is needed on most alluvial soils. About 49 palms are planted per acre. Fruit is continually being produced by the mature palm. Harvesting is carried out at intervals of from five to ten days. Although fruit bunches ripen throughout the year the yield of fruit usually reaches its peak in August and September, with a lesser peak in March and April. Low yields often occur during January, February, May and June.

Red palm oil from the pulp of the fruit of the oil palm is produced by steaming the fruit at 100° C to soften the pulp and destroy lipolytic enzymes. The fruits are then sent to the hydraulic presses where they are squeezed to remove the pulp oil. The oil is clarified to remove water and other impurities and packed for export. The extracted cakes are dried and the kernels are shelled and packed for shipment to a kernel extraction plant. Red palm oil plants built to serve 1,000 to 5,000 acres of oil palm estate have capacities of one to two tons of pericarp (pulp) oil per hour. Red palm oil was not used for food purposes at the time of the survey.

Fruits

Throughout Malaya one of the prominent features of small holder agriculture is the existence of mixed plantings of such fruit trees as durian (*Durio zibethinus*), rambutan (*Nephelium lappaceum*), mangosteen (*Garcinia mangostana*), langsat (*Lansium domesticum*), chiku (*Achras zapota*) and many others (see Appendix 16). In 1960 there were 135,000 acres of mixed fruit. There are some specialized plantings of mandarin orange, but many of those in the Telok Anson area have been ravaged by disease. Bananas (*Musa paradisiaca*), planted on an estimated 40,000 acres, are a valuable crop and find a ready market. Many of the fruits bear seasonally, with a main crop in July and August and a second, smaller crop in December. There is some variation in the ripening season from one location to another. For instance, durians are available on the east coast in September and October, long after they have disappeared from west coast markets (Table 10).

TABLE 10. THE SALE AND DISTRIBUTION OF FRUIT TREES BY THE AGRICULTURE DEPARTMENT AND COMMERCIAL NURSERIES IN 1960[1]

Budded rambutan	54,440
Budded durian	2,630
Mandarin orange	64,750
Other citrus	1,090
Other mixed fruits	11,640
Total	134,550

1/ See reference (11).

Vegetables

Fresh vegetables for local consumption are produced all over the country, mainly around the towns. Vegetable production is intensive, often with the use of fertilizer and chemical pesticides. Vegetables of the temperate climate are produced in the accessible highlands for sale in towns (see Figure 4). Comparatively few vegetables are produced in the kampongs of the paddy raising areas. An expansion of vegetable production for home consumption would be desirable. Production for market faces hazards of overproduction and consequent price slumps.

Tea (Thea sinensis)

There are about 5,000 acres each of highland and upland tea. Most of the acreage is owned by estates. The highest quality tea is grown in the uplands.

Cocoa (Theobroma cacao L.)

Cocoa growing has received serious attention in Malaya since it has been estimated that yields of 600 pounds of beans per acre might be obtained. Cocoa is grown on a commercial scale in Trengganu and Perak. Unfortunately, a pathological condition, "die-back," of unknown cause, has greatly reduced the yields of beans and made cocoa raising uncertain at present.

Coffee (Coffea liberica Hiem)

There were 15,300 acres of coffee in 1959, most of it of the Liberica type, produced almost entirely by small holders. Over 75 percent of the country's coffee crop is concentrated in Selangor, mainly in the coastal areas. The crop is consumed entirely by the local market. It is estimated that only a limited further expansion will be possible if market saturation is to be avoided. Yield of beans per acre is high and a gross annual return of M $ 800 to 900 is obtained from a mature stand. Coffee is concentrated on muck soils and coastal clays. It is a particularly convenient crop to be grown under coconut palms.

Pineapple (Ananas sativus)

Pineapples are grown for local fresh consumption (Sarawak and Mauritius) and for canning (Singapore Spanish), the latter on peat soils in Johore. More than half of the acreage is in estates. Modern practices are employed in pineapple culture including use of hormones to regulate setting of the fruit. Under natural conditions a major harvest occurs May to July and a secondary harvest at the end of the year. Production could be greatly expanded since there are an estimated 1,000,000 acres of peat soils in Malaya. The critical factor is the development of a large overseas market for the canned product.

Tapioca (Manihot utilissima)

Large acreages are devoted to tapioca, grown commercially as a catch crop. Old mining land may be used, or it may be interplanted with young rubber, or grown on other cheap land. The principal growing areas are Perak state, where there are also many tapioca flour plants. A new plant for producing alcohol from tapioca is being erected near Ipoh. Tapioca is in low esteem as a food crop, although it is used in special dishes to some extent.

Sugar

Sugar cane is grown in Malaya on a very small scale, primarily for home consumption of the juice as a sweet beverage. Some sugar (gula kabong) is produced from the sap of the kabong palm that grows wild in parts of Malaya, particularly along the Perak River.

Other Crops

Some of the minor crops of Malaya are pepper (Johore state), derris root, betel nut or areca, tobacco, maize, ground nut, sweet potato and yams, taro, ginger, chillies, mustard, long beans, eggplant, leeks, radishes, cabbage, onion, cucumbers, melons, nutmeg and cloves. (See Appendix 16 for a list of the edible plants of Malaya.)

Livestock

Cattle

Two types of buffalo are raised in Malaya, the popular wide-horned Kerbau or Malayan swamp buffalo of Siamese origin, and the less numerous curly-horned Indian Surti or Murrah. Altogether they total 276,000 head. The Murrah is used for milk as well as draft. The Siam-Kedah breed of cattle are moderate-sized, general purpose, draft, beef and milk animals, in numbers about equal to buffalo. Some upgrading of native dairy cattle is being done on an experimental scale, chiefly through the use of Red Sindhi bulls. Milk production is quite limited, dairy cattle giving less than 1,000 pounds of milk per year (see Figure 5). Beef production is somewhat restricted because of the slow growth rate of native cattle. Goats are prevalent in the kampongs (278,000 head). Swine raising is mainly in the hands of the Chinese. The popular South China pig, raised largely on a diet of vegetables, reaches a weight of 150 pounds in 9 to 10 months. Six hundred fifteen thousand locally raised pigs were slaughtered in 1961.

Efforts to improve livestock by animal breeding, as well as forage investigations, are carried out under the Veterinary Department. Improved stud animals are made available to farmers. In some states legislation makes compulsory the castration of scrub bulls and many states restrict the slaughter of female breeding stock. To a large extent animal diseases are controlled in Malaya, the peninsula being free of rinderpest, foot and mouth disease and rabies. Haemorrhagic septicaemia is the most common disease of buffalo and cattle.

Expansion of the milk and meat industry depends upon extension work at the kampong level in animal husbandry and pasture management. A much higher livestock population can be supported if improved practices are adopted. For instance, fodder crops available produce 10 or more tons of digestible nutrients per acre and pasture grasses will do the same. Such yields make it theoretically possible to carry 2 or 3 head of cattle per acre.

Poultry

Poultry raising is widespread. Chickens and ducks run free everywhere in the countryside. Some commercial operations of 5,000 to 10,000 birds are found in the Penang and Johore Bahru areas. In 1961, there were an estimated 17,000,000 chickens and ducks in the Federation.

Meat

Fresh meat is consumed very soon after slaughter by the people of Malaya. To satisfy the desire for freshness abattoirs often slaughter twice a day - in the early morning for sale in the morning market, and around noon for sale in the afternoon market. Most slaughtering is in accordance with Moslem rites, and the pig slaughtering areas are separated from the rest of the abattoir. Carcasses and entrails are inspected for disease by veterinary officers in the larger slaughter houses. In Kuala Lumpur transportation of fresh meat to market is restricted to trucks with zinc-lined interiors.

Fish

There are about 55,000 fishermen in Malaya, 25,000 on the east coast and 30,000 on the west coast. In 1960, of a total of 23,500 registered fishing boats, 8,900 were power-driven. The usual fishing voyage lasts less than a day. The catch is divided into shares, large portions being received by the boat owner, net owner, fish locator and captain (see Table 11).

The use of synthetics such as nylon for gear has increased rapidly. On the west coast synthetic drift nets have almost completely replaced ramie and cotton nets in the main drift net fleets. A similar process has recently started on the east coast.

The east coast is subjected to the full force of the northeast monsoon each year from roughly the middle of November to the end of March, when it is virtually impossible to launch or sail a fishing boat except for the larger, diesel-engined craft. In these, the larger nets cannot be used in the rough sea and instead hand lines, drift nets and fish traps are used. Consequently, few fish are caught during this season.

TABLE 11. FISH LANDING, FEDERATION OF MALAYA[1/]

State	Year 1958	Year 1959	Year 1960
	(100 long tons)		
Perlis	23	42	42
Kedah	38	136	136
Penang	76	80	100
Perak	373	389	521
Selangor	198	150	164
Negri Sembilan	4	4	3
Malacca	37	27	26
Kelantan	53	39	41
Trengganu	108	109	145
Pahang	80	77	89
Johore	131	132	127

1/ See reference (2).

The west coast is screened from the full force of the northeast monsoon by the high hills of the Main Range. Although the northwest monsoons bring a change in weather from about May to September, the Straits of Malacca are

protected by the island of Sumatra. Hence, although the west coast has its off-season, there is never a virtually complete cessation of fishing.

The fishermen generally sell their catch to a dealer who arranges for its processing and transport to market. Formerly much of the catch was dried, but with the widespread availability of ice and excellent transportation, most fish now reaching market are fresh. One dealer has extended the process further by buying fish at low prices at times of surplus, freezing them, and selling during periods of poor catches. His operation has been successful, and he is now expanding his freezing and holding facilities. The government is encouraging fishermen's cooperatives, so that they may market their catch in bulk and be placed in a bargaining position with the dealers. The cooperatives are also encouraged to combine to form their own transport and marketing organization and to run their own ice plants.

Dry salting is still the most common form of fish processing. Cleaned fish are soaked overnight in a saturated salt solution and then sun-dried for one to three days. Small fish such as ikan bilis (anchovy) and udang (prawns) are often boiled in brine for a short time and then sun-dried. Some ikan bilis are dried without salting or boiling. Boiling in brine is also used with kembong (chub mackerel) as a temporary measure of preservation. The boiled fish are then held in cold rooms.

Udang baring (small shrimp) are processed into belachan. The shrimp are mixed with about 10 percent of their weight in salt, dried to remove approximately half their moisture, and ground several times to produce a purple paste, which is stored from three weeks to several years in order to develop its characteristic flavor. Belachan is widely used as a flavoring ingredient in curries and sauces. Some ikan bilis are used to prepare budu, a salt-fermented product which is widely used as a seasoning (see Appendix 15, 36 and 69).

Fish or prawns are also used to prepare keropok, a widely used delicacy. The cooked fish are ground together with tapioca and the resulting paste is formed into long cylinders which are cooked and sliced before drying. When cooked in oil they expand to give a light crunchy cracker.

There is very little fish canning in Malaya. A plant in Penang with a capacity of about ten tons a day produces canned tuna for export. The tuna is obtained from Japanese fishing boats operating in the Indian Ocean. Its sale in the Federation is hampered by the low regard for tuna as a food fish in Malaya. At one time waste tuna meat from this factory was thought to have some value in preparation of fish meal for human consumption, but this scheme has been abandoned and the waste meat is now dried and sold for animal feed.

An intensive effort is under way to increase the fresh water fisheries which now provide an estimated 25,000 tons of fish a year. For many years the Federation has had a number of Chinese carp ponds. Efforts have been made to find other species which would be more adaptable to Malayan conditions. Tilapia mossambica was one of the first to be tried and has been quite popular. Recent developments have overcome the tendency of this species to breed too quickly. Old mining pools have been stocked with Tilapia, a development made possible by use of piscicides which simplify the clearing of predatory fish from the ponds. Lampan jawa, Sepat Siam and Catala catala have also proven to be well adapted.

Sepat Siam is particularly suited for stocking in irrigation channels and in paddy fields. Lampan jawa is now an important pond fish. The government is distributing fry free to pond owners all over the country.

Currently, the fry of the giant prawn are being reared to enable the stocking of paddy fields with this very desirable species. Other current studies include development of methods for rearing fry of the temoleh, a large, mollusk-eating, river carp, a fish held in high esteem whose numbers have been greatly reduced as a result of overfishing. The native fish Aruan (snakehead) and Keli (catfish) make up a large part of the wild fresh water catch.

Cockle rearing has been developed into an important aspect of the fishing economy, especially in Penang and Perak. Extensive tracts of sheltered mud flats have been converted to cockle beds, and former depleted natural beds have been reestablished. The annual production of cockles is about 10,000 tons a year.

Two Marine Fisheries Schools have been established, one at Glugor on Penang Island, and another at Kuala Trengganu on the east coast, where fishermen are taught simple navigation and boat handling, given practical and theoretical instruction in repair and maintenance of boat engines, and instructed in modern fishing methods. Fishermen attend three- to five-month courses and are paid during the training period. To date some 600 fishermen have attended these schools. It is presently planned that the Fisheries School in Glugor will eventually be extended to offer three- to four-year courses in navigation and fish technology, processing and refrigeration. This will provide a cadre to aid in the establishment of distant-water fishing fleets operating in the open sea, to exploit the eastern part of the Indian Ocean and fish for the large stocks of tuna and other fish available there.

Marketing

Virtually all marketing of agricultural and fishing produce is carried out through middlemen, although in some areas producers' cooperatives have entered the field. Sales are for cash on an individual basis except for a few auction markets for fish such as are found in Kuala Trengganu and Malacca. Even where auction markets exist a large proportion of trade is outside these facilities. Middlemen frequently deal with retailers on a credit basis, often extending credit for three months on nonperishable items such as canned and dried foods. Credit extension is a reflection of the competition between middlemen and brokers in obtaining customers for their goods. Such credit extensions also enable retailers to operate with a minimum of working capital and have fostered a proliferation of retailing outlets.

Transportation facilities being quite good, foods are quickly sent from one part of the country to another in response to price differentials, thus contributing to a relatively stable market. As an example, fish is routinely sent by truck from Kuala Trengganu on the east coast to Kuala Lumpur, a 12-hour trip. Facilities along the way for replenishing the ice maintain the fresh fish in good condition.

The west coast has a good framework of hard surfaced roads. The east coast is not so well developed so far as roads are concerned, and the roads

are also subject to flooding during the monsoon season. Even though few marketable commodities are produced on the east coast during the monsoon season, the seasonal breakdown of surface transportation in this area limits the supply of foodstuffs which might alleviate the sparsity of the diet in the east during the winter months.

Food Processing

Much of the food processing in Malaya is in the hands of small businessmen who make products such as dried fish, rice vermicelli, pickles, soy products and baked goods. There are some larger establishments in rice milling, pineapple canning and biscuit manufacture.

Rice and Rice Products

The most important processing industry is milling. Multitudes of small mills throughout the country convert paddy to polished rice and a ground mixture of hulls and bran. These mills serve the farmers and mill on a fee basis. There are also a number of large conventional type mills which require that the paddy be sufficiently dry so that the husks can be easily removed. After dehusking, the grains are sent through polishers in a series, usually three in number, which abrade the grain between a moving stone and stationary rubber plates to remove the brown bran layer. The use of several polishers in series permits a close adjustment of the polishing process, removes a minimum amount of bran in achieving a given degree of polish and avoids excess amounts of broken rice.

Production of vermicelli, particularly bee hoon, is widespread. Broken or low-priced Kedah rice is wet-ground in a stone mill. The gruel is placed in a thick cloth bag and the excess water is allowed to run off, then pressed out. (This water contains most of the water-soluble nutrients of the rice.) The rice residue is heated to gelatinize the starch and then pounded before being extruded into long strings. Some wheat flour may be added to improve the strength of the product. The fresh bee hoon is dried for several hours over a fire, treated with sulfur dioxide and sun-dried to a low moisture content. Another type of rice noodle, koay teow, is made by gelatinizing the ground rice. This is sold in the soft, undried state.

A slightly fermented rice product called tapai is made from glutinous rice, tapioca and yeast, kneaded, together with water, to form a ball which is allowed to set undisturbed for several days. The alcohol content is around 3 percent.

Wheat Products

Bread is available in all the towns. Size of bakeries varies, but the majority are quite small. A straight-dough process is used in bread making. Virtually all the ingredients are imported - wheat flour from Australia and other countries, yeast, milk powder, shortening, salt. Some of the bread, particularly from the large bakers such as Cold Storage, Ltd., is enriched with vitamins (1.1 mg thiamine, 0.7 mg riboflavin, 10 mg niacin, 12 mg iron per pound).

Biscuits are perhaps more popular than bread. Here again there are a large number of small bakeries, but the production of a few large bakers dominates the trade. In the large bakeries automatic machinery and ovens capable of producing 10 pounds of biscuit per minute are used. A plant will have several of these machines, each of which costs about M $ 500,000. Chemical- and yeast-raised type biscuits are produced. Tallow is frequently used as shortening. The biscuits are packed in returnable tin containers for shipment.

A pasta-type product known as meen is also produced on a small scale. A thick dough made with wheat flour, water and sometimes a yellow dye is kneaded and rolled flat. Strips are cut and dried, or the kneaded dough is extruded into strips which are dried.

Milk Products

Milk products are largely imported. Dehydrated products are usually used in that form by commercial users such as bakeries, but the common retail outlet for milk is as canned sweetened condensed milk. A number of factories reconstitute skim milk powder, butter, or ghi into condensed milk, which is put up in 14 ounce cans and sterilized. There is also a limited market for reconstituted sterilized whole milk, which is sterilized at 120° C for 20 minutes and is usually sold in bottles. Bottles and cans cost about M $ .10 each, but bottles are returnable. Proprietary milk products for infant feeding are available. Ice cream is readily available.

Cold Storage

The larger towns have cold storage facilities. Selangor province has about 500,000 cubic feet of cold storage, of which 350,000 is below 30° F and 3,000 is below 0° F. There are an estimated 1,000,000 cubic feet of cold storage in the Federation. Many towns, particularly fishing centers, have ice plants. Ice production is roughly estimated at 1,350 tons a day. Most facilities are the conventional brine cooling, still water type, but there are also continuous ice makers such as that run by the Heng Hwa Cooperative in Malacca. Ice is widely used to maintain fresh fish in good market condition.

Starch

Tapioca is processed in medium-sized plants employing 100 or less people. The roots are bought at about M $ 3 a picul. A typical plant produces 70 piculs of flour, flake, or pearl a day. The roots are cleaned, pulped, the starch extracted with water and then washed several times with water. The starch is then pearled and gelatinized or gelatinized directly. The gelatinized product is dried for 24 hours before grading and packing. Most tapioca is manufactured for export.

Starch is produced from the trunk of the sago palm in much the same manner, but the sago starch industry is much smaller than the tapioca industry.

Pineapple

Pineapple canning is a flourishing industry concentrated in Johore state (see Figure 4). Modern canneries pack the fruit in a wide variety of styles

for export to European markets. The maintenance of high quality in the exported product is aided by the Malayan Pineapple Industry Board, which also carries out research for the industry. Thirty-three thousand (English) tons of canned pineapple were exported in 1961.

Other

Outside of the condensed milk and pineapple industry, relatively little preservation by canning is done in Malaya. A tuna canning plant in Georgetown (or Penang) which packs about 140 cases of tuna a day (2,500 pounds) has a capacity several times higher. The fish are quartered, steamed at 100° C for two hours, uncannable meat removed (about 50 percent of original weight) and packed in cans together with salt and water or soy oil. The cans are then cooked two hours at 112° C. Another canning plant in Georgetown packs fruits and curries. Both these factories produce largely for export.

The Rural Development Council has been encouraging some small fruit canning enterprises in the rural areas. A plant for the canning of kabong fruit has been in operation in Parit.

Soy Products

A number of products are made from soybean milk. The soaked soybeans are wet-ground in a stone mill and the suspension is filtered. The resulting milk may be sold as such, or with sugar and flavor added, bottled and sterilized. The milk may be heated in shallow pans and the resulting skin removed and dried to be sold as fu chok. Soy curd or "tau foo" is produced by coagulating the milk with calcium salts. All these products are produced mainly in small three- to eight-person establishments.

Containers

Cans are available from the Metal Box Company, Ltd., which has a plant at Petaling Jaya capable of producing more than 1,000,000 cases of cans a year. Since much of the demand is for printed cans intended as retail packages this plant is set up for extensive metal printing and the production of a wide variety of can sizes. The plant at Petaling Jaya maintains a laboratory which studies can quality control and does developmental work designed to expand the use of cans in the Federation. The company has several field men who assist customers in dealing with packaging and canning problems.

Most of the cans the pineapple industry uses are imported from Singapore. There are glass bottle and container makers in Malaya but needs are met largely through import. Imports of bottles amounted to 300,000 gross in 1961. Glass containers are in short supply.

Oils

Coconut oil is produced from copra of low moisture content. A low pressure screw press removes about 70 percent of the available oil. The press cake then goes to the high pressure press where the remainder of the oil is extracted. The combined oil is filtered in a plate filter and packed in drums for shipment. Most coconut oil factories are modest in size, having one or two pair

of presses producing 50 to 100 piculs of oil per day. Copra prices to the mills are around M $ 22 a picul. The press cake sells for M $ 7 a picul. The main season is July. The supply of copra is often inadequate. In spite of imports, a number of mills operate at reduced capacity and some smaller ones have closed.

The production of red palm oil is discussed above, on pp. 39-40.

Imports

Malaya relies on imports for many foodstuffs (see Table 9 and Appendix Table 11). All the cane sugar, salt, wheat and flour are imported. Virtually all dairy products, leguminous seeds, mutton from sheep, oranges, canned goods, yeast and alcoholic beverages come from abroad. One third of the rice and one-half the eggs consumed are imported. Food items account for over 25 percent of the imports of Malaya. While many of these items cannot be produced in Malaya or can only be produced inefficiently great possibilities still remain for replacing imports with local production, particularly rice, and thereby effectively increasing the amount of foreign exchange.

Summary

The food supply is adequate and the quality of individual diets, except on the east coast during the monsoon, depends more on the purchasing power and selectivity of the consumer than on the availability of different products. At the present time the food economy depends heavily on imports for grains, sugar and dairy products. The government is engaged in an ambitious program to increase productivity in agriculture and fishing.1/

Continued governmental efforts will double and perhaps triple the domestic rice supply, resulting in self-sufficiency in this grain until about 1990, when the population is expected to double its present size. Vegetable, pork and poultry production can be expanded to meet any conceivable increase in domestic demand. The raising of cattle, buffalo and goats for meat cannot be expanded as readily, although the development of improved technics for utilizing the high forage producing capacity of Malayan soils can greatly aid this industry. Dairy production is low and is likely to remain so until average production per cow is increased markedly.

Fish landings are adequate for the present demand, but this demand can be expected to increase with rising consumer incomes. Most of the fish is now caught close to shore. However, it is likely that a large part of increased demand will have to be met through exploitation of deep sea fisheries. The development of inland fishing will be of great benefit to the rural population but will not provide for the increasing number of people in the larger towns.

1/ The Annual Reports of the Department of Agriculture (11) as well as special reports (12) provide excellent summaries of the agricultural situation in Malaya. The detailed analysis of food production and availability in Malaya in 1960 prepared for the Malayan government by Dr. Sedky (12) takes into account a number of factors not dealt with in the present report dealing largely with 1961 data. These differences in reference year and methods of data handling result in differences in the figures; however, the quantitative descriptions of the food situation are substantially similar in both reports.

Transportation and marketing facilities are well adjusted to the supply and demand. Modification of these facilities can be expected to keep pace with changing conditions. The road network is being constantly expanded and improved.

An expansion of food processing can be expected with a rising population and per capita income. Industrial expansion will increase the demand for convenience foods. Preserved foods would be most beneficial to overcome the temporary scarcity of fish and vegetables on the east coast during the monsoon, but in this area the relatively low incomes limit the ability of the people to purchase such foods. Increases in the pineapple industry depend to a large extent on an expansion of the European market.

The present food processing industries as well as the tropical crop raw material industries provide a training ground for the skilled workers needed for the further development of industrialization. Educational institutions also provide technically trained people. There is still a shortage of personnel with sufficient training to take full advantage of the great opportunities in Malaya for industrial expansion. This shortage should be overcome by a continued development of technical education facilities.

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VI

THE ARMED FORCES

Clinical

The Armed Forces of the Federation of Malaya comprise (a) the regular Armed Forces, which consist of (1) the Federation Army, (2) the Royal Malayan Navy and (3) the Royal Malayan Air Force, and (b) the Volunteer Armed Forces which consist of (1) the Territorial Army, (2) the Royal Malayan Naval Volunteer Reserve and (3) the Royal Malayan Air Force Volunteer Reserve. The Armed Forces are multiracial but there is a predominance of Malays in approximately the following proportions: 93 percent Malayan, 5 percent Chinese and 2 percent Indian. During this survey only personnel belonging to the regular Armed Forces were examined. It should be pointed out that all potential recruits for the Armed Forces undergo a complete preliminary medical examination and hence those accepted are in better health than the average of the population. Medical standards for acceptance into the Armed Forces follow a pattern very similar to those in the British and American Armies commonly known as Pulheems.

Military examinations included five infantry battalions, one reconnaisance regiment, one static garrison and one recruit training depot. A total of 1,268 individuals was examined in eight different military locations. Tables 17 and 18 in the Appendix indicate the numbers of individuals examined at each of these locations, their average age, area of origin and time in service. This sample may have shown a disproportionately large number of Malays, but, insofar as was practicable, all racial groups were included.

The usual anthropometric data including height, weight and skinfold thickness measurements were obtained and a comparison is shown in the following table (12) and in Figures 8-10 and Appendix Tables 19 and 20.

The men in military service were found to be in excellent physical condition as judged not only by gross appearance, but also by the relative infrequency of positive physical findings indicative of malnutrition. The commonest positive finding was nasolabial seborrhea, followed by diffuse swelling of the interdental papillae. There was also some localized swelling of the interdental papillae. Other findings were observed so infrequently that they will not be mentioned here (see Table 13 and Tables 21-24 in the Appendix).

Because of the interest expressed by the Ministry of Health, measurements were made of the blood pressure of all examinees over the age of 6. This was of particular interest in the military, because here an accurate appraisal could be made of the salt content of the food, which was found to be moderately high by American standards. It was observed that approximately 1 percent of the military had hypertension as defined (systolic blood pressure 150 mm Hg or above and diastolic blood pressure - defined as disappearance of sound - 100 mm Hg or above: see Tables 14 and 15).

As anticipated there was an upward trend in blood pressure with age and with increase in body weight (see Tables 14 and 15). There also was an upward trend in body weight of those men who had been in service more than two

TABLE 12. HEIGHT, WEIGHT AND AGE OF FEDERATION OF MALAYA ARMED FORCES COMPARED WITH OTHER COUNTRIES

	Malaya				Thailand	Vietnam	Burma	South Korea	Taiwan	Philip-pines	United States
	Malays	Chinese	Indians	Average, All Races	(1)1/	(2)	(3)	(4)	(5)	(6)	(7)
Mean height (cm)	165.5	162.6	166.8	162.9	163.2	159.5	163.0	164.1	164.3	162.5	173.0
Mean weight (kg)	57.9	56.9	59.4	57.9	55.4	51.2	52.9	58.7	55.4	55.4	68.0
Mean age (years)	25.9	23.6	23.0	25.8	22.3	25.5	26.5	23.5	28.5	27.6	--

1/ Figures in parentheses are numbers of references given at the end of this chapter.

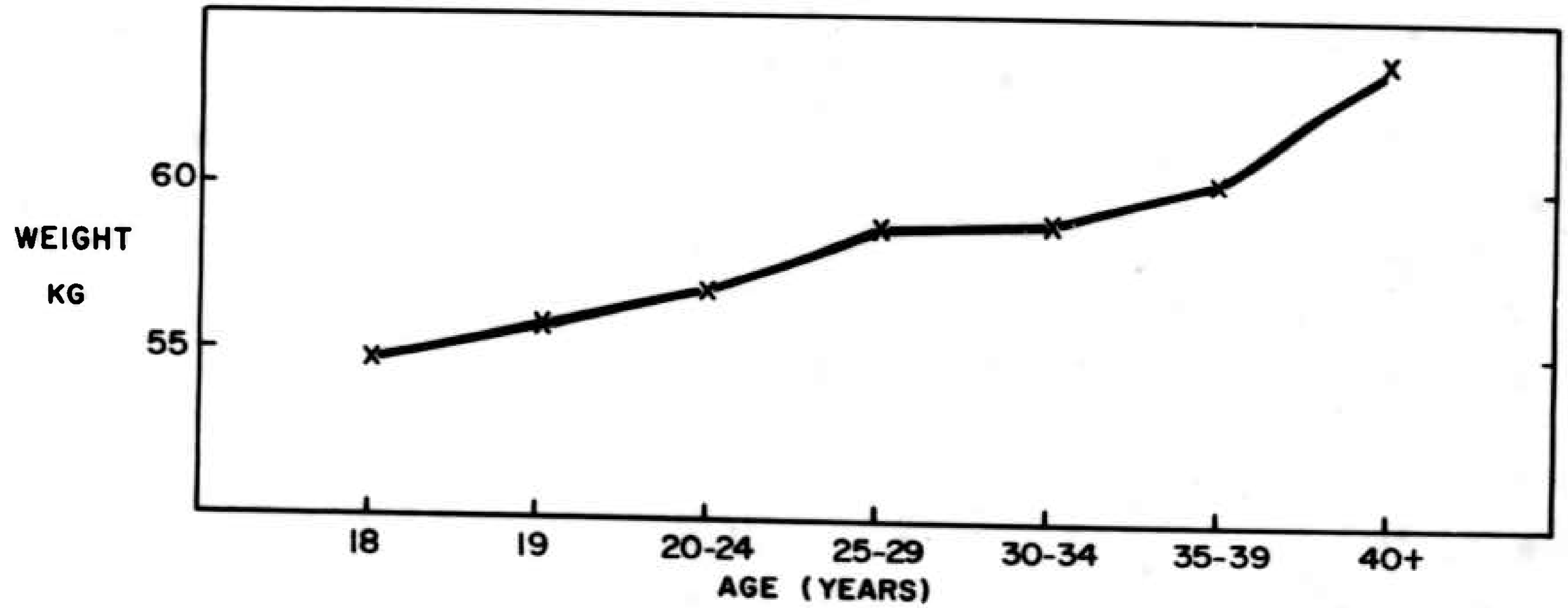

FIGURE 8. WEIGHT BY AGE, MILITARY, MALAYA

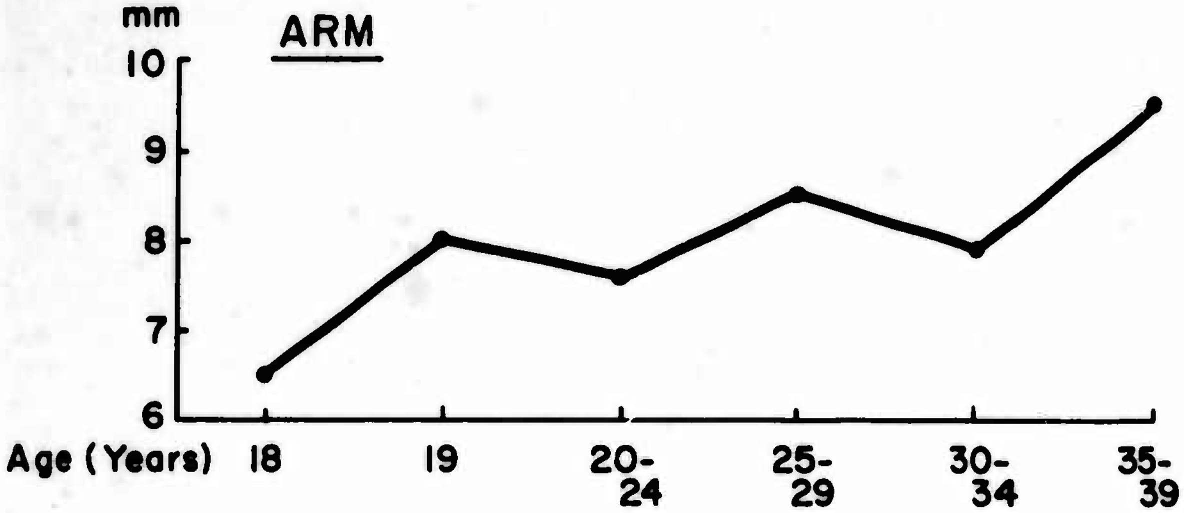

FIGURE 9. ARM SKINFOLD THICKNESS BY AGE, MILITARY, MALAYA

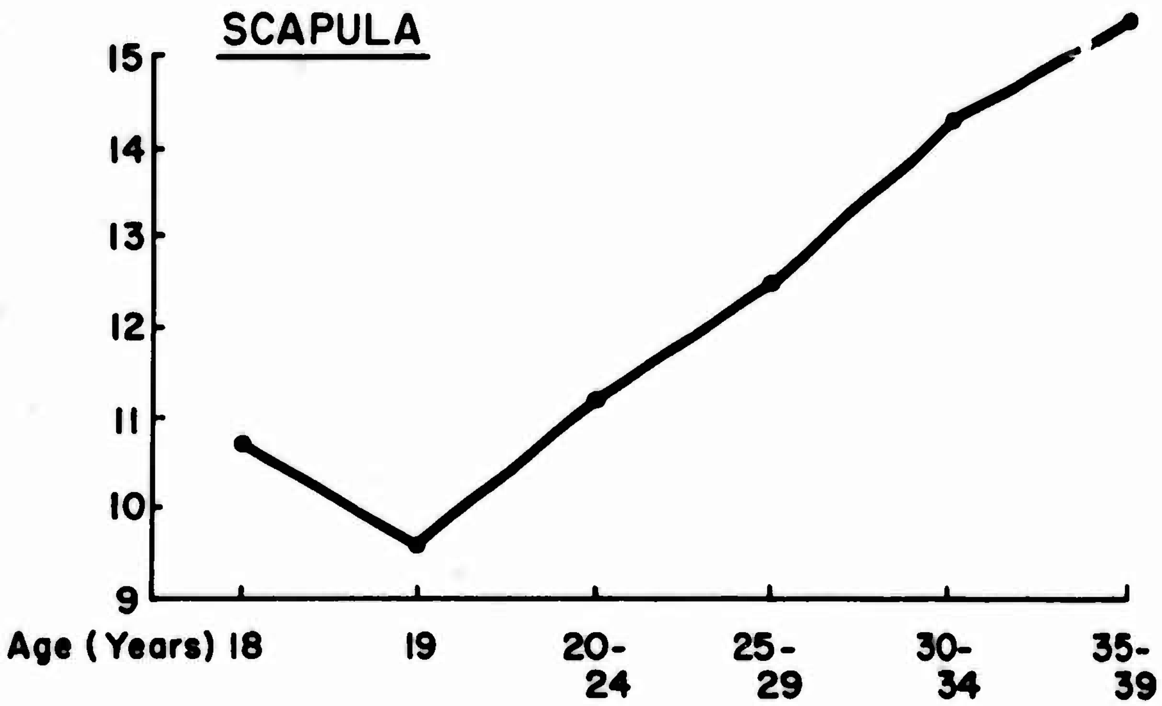

FIGURE 10. SCAPULA SKINFOLD THICKNESS BY AGE, MILITARY, MALAYA

TABLE 13. ABBREVIATED CLINICAL FINDINGS BY LOCATION, MILITARY, MALAYA

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
Number examined	201	150	101	50	85	271	200	210	1,268
					Percent Prevalence				
Skin, Face and Neck									
Nasolabial seborrhea	12.9	2.0	18.8	4.0	9.4	10.7	16.5	13.3	11.7
Lips									
Angular lesions	0.5	1.3	--	--	2.4	0.7	1.0	--	0.7
Angular scars	1.0	13.3	--	--	1.2	--	1.0	0.5	2.0
Cheilosis	--	0.7	--	--	--	--	--	--	0.1
Gums									
Swollen red papillae - Localized	8.4	17.3	1.0	--	4.7	3.3	4.0	1.4	5.4
Diffuse	5.5	22.0	--	--	16.5	5.5	19.5	4.3	9.5
Tongue									
Filiform papillary atrophy - Slight	1.0	--	1.0	--	3.5	1.1	1.5	1.0	1.1
Moderate	--	--	--	--	--	0.4	--	--	0.1
Glossitis	--	--	--	--	2.4	--	--	--	0.2
Magenta colored	--	4.0	--	--	--	--	--	--	0.5
Glands									
Thyroid enlarged - Grade I	0.5	1.3	1.0	--	--	1.1	0.5	--	0.6
Skin, General									
Follicular hyperkeratosis - Anywhere	1.5	0.7	2.0	--	--	0.4	1.0	1.4	0.9
Arms	0.5	--	--	--	--	--	1.0	--	0.2
Back	1.0	0.7	2.0	--	--	0.4	0.5	1.4	0.8
Thighs	--	--	--	--	--	--	0.5	--	0.1
Lower Extremities									
Loss of ankle jerk - Unilateral	1.0	--	1.0	--	--	0.4	0.5	1.4	0.6
Bilateral	1.5	2.0	3.0	--	4.7	0.7	3.0	1.0	1.8
Calf tenderness	--	--	--	--	--	0.7	--	--	0.2

TABLE 14. FREQUENCY DISTRIBUTION OF BLOOD PRESSURE BY AGE, MILITARY, MALAYA

	Systolic							
Age (years)	18	19	20-24	25-29	30-34	35-39	40+	Total
Number examined	25	63	506	385	218	67	3	1,267
Mean	115.0	119.7	121.0	123.9	122.9	126.9	130.0	122.4
S.E.1/	2.5	1.5	0.6	0.7	1.0	2.6	3.3	0.4
mm Hg								
80-88			1		1			2
90-98	2	1	17	7	6	1		34
100-108	7	10	62	40	31	9		159
110-118	7	24	146	97	44	16		334
120-128	6	13	158	115	64	17	1	374
130-138	2	11	77	79	45	12	2	228
140-148	1	40	35	32	16	7		95
150-158			10	9	9	1		29
160-168				5	2	1		8
170-178								--
180-188						2		2
190-198				1				1
200-208								--
210-218								--
220-228						1		1

TABLE 14 (Continued) FREQUENCY DISTRIBUTION OF BLOOD PRESSURE BY AGE, MILITARY, MALAYA

	Diastolic															
	(Change of sound in tone)								(Disappearance of sound)							
Age (years)	18	19	20-24	25-29	30-34	35-39	40+	Total	18	19	20-24	25-29	30-34	35-39	40+	Total
Number examined	25	63	506	385	218	67	3	1,267	25	63	506	385	218	67	3	1,267
Mean	77.8	81.6	79.0	81.4	81.7	85.2	79.7	80.6	73.7	75.6	73.3	76.0	76.6	79.8	78.7	75.2
S.E.1/	1.5	1.3	0.5	0.5	0.7	1.5	3.3	0.3	1.5	1.4	0.5	0.6	0.7	1.6	3.3	0.3
mm Hg																
10-18								--			1					1
20-28			2					2			2					2
30-38								--			2					2
40-48								--		1	3	1		1		6
50-58			3	2	2			7		2	28	15	5	1		51
60-68	3	5	61	30	10	2		111	5	12	122	83	46	8		276
70-78	9	23	165	117	73	19	1	407	14	21	196	132	87	23	1	474
80-88	12	21	196	150	82	24	2	487	5	20	115	111	50	21	2	324
90-98	1	10	62	63	40	13		189	1	6	27	38	24	7		103
100-108		3	16	22	7	6		54		1	10	4	4	4		23
110-118		1	1		4	2		8					2	2		4
120-128						1		1				1				1
130-138				1				1								--

	Percent of hypertensive levels							
Age (years)	18	19	20-24	25-29	30-34	35-39	40+	Total
Number examined	25	63	506	365	218	67	3	1,267
≥150 (Systolic)			2.0	3.9	5.0	7.5		3.2
≥100 (Diastolic)	4.0		2.0	1.3	2.8	9.0		2.2
≥150/100			1.0	0.8	1.4	4.5		1.0

1/ S.E. = standard error.

TABLE 15. **FREQUENCY DISTRIBUTION OF BLOOD PRESSURE BY PERCENT OF "STANDARD WEIGHT," MILITARY, MALAYA**

	Systolic					
Percent of "Standard Weight"	70-79	80-89	90-99	100-109	110+	Total
Number examined	45	531	436	166	89	1,267
Mean	117.2	119.3	122.8	125.6	135.6	122.4
mm Hg						
80-88		1		1		2
90-98	5	18	10	1		34
100-108	8	89	48	13	1	159
110-118	10	165	117	31	11	334
120-128	14	150	130	60	20	374
130-138	5	74	83	37	29	228
140-148	3	27	36	15	14	95
150-158		7	12	5	5	29
160-168				2	6	8
170-178						--
180-188				1	1	2
190-198					1	1
200-208						--
210-218						--
220-228					1	1

TABLE 15 (Continued) FREQUENCY DISTRIBUTION OF BLOOD PRESSURE BY PERCENT OF "STANDARD WEIGHT," MILITARY, MALAYA

	Diastolic											
	(Change of sound in tone)						(Disappearance of sound)					
Percent of "Standard Weight"	70-79	80-89	90-99	100-109	110+	Total	70-79	80-89	90-99	100-109	110+	Total
Number examined	45	531	436	166	89	1,267	45	531	436	166	89	1,267
Mean	78.1	78.4	80.5	83.4	89.9	80.6	73.0	73.0	74.9	77.6	84.6	75.2
mm Hg												
10-18						--			1			1
20-28		1	1			2		2				2
30-38						--	1	1				2
40-48						--		4	1	1		6
50-58		4	2	1		7	3	30	13	3	2	51
60-68	8	62	30	8	3	111	10	126	101	34	5	276
70-78	13	180	160	48	6	407	18	214	168	53	21	474
80-88	18	218	162	56	33	487	10	129	114	39	32	324
90-98	5	55	62	38	29	189	2	20	29	32	20	103
100-108	1	10	18	13	12	54	1	5	9	3	5	23
110-118		1	1	2	4	8				1	3	4
120-128					1	1					1	1
130-138					1	1						--

	Percent of hypertensive levels					
Percent of "Standard Weight"	70-79	80-89	90-99	100-109	110+	Total
Number examined	45	531	436	166	89	1,267
≥150 (Systolic)		1.3	2.8	4.8	15.7	3.2
≥100 (Diastolic)	2.2	0.9	2.1	2.4	10.1	2.2
≥150/100		0.2	0.9	1.8	5.6	1.0

years, or, stating this another way, as men grew older their body weight tended to rise. Racial differences in body weight are meaningless because of the wide disparity in numbers of different races in this sample. Of further interest is the comparison of percent of "standard weight" and the place where the individuals ate their meals, namely in the mess hall or at home (Table 16). There was a slight trend toward heavier weights of those who ate at home, but this may have been due to the fact that these were older people who had spent more years in service.

TABLE 16. PERCENT "STANDARD WEIGHT" BY MESSING LOCATION, ABBREVIATED EXAMINATIONS, MILITARY, MALAYA

Messing location	Mess hall	Home	Unknown	Total
Number	694	569	4	1,267
Mean	91.5	94.5	93.5	93.0
% "Standard Weight" (kg)		Percent Distribution		
70-79	3.4	3.7	--	3.6
80-89	44.7	38.8	25.0	42.0
90-99	38.8	28.8	75.0	34.4
100-109	9.4	17.7	--	13.1
110+	3.7	10.9	--	6.9

The clinical findings in the military personnel can be summarized by saying that these men appeared to be in excellent health and had few signs of nutritional defects. The incidence of hypertension was higher than that which would have been anticipated by American standards (approximately 5 percent; see Tables 14 and 15).

Chemical

Samples of blood and urine were collected from approximately every fourth subject given a detailed physical examination. These samples were stored in ice and transported to the clinical laboratory at Kuala Lumpur, usually arriving within 24 hours after collection. Various determinations were performed on the samples in an effort to obtain biochemical data on the relatively recent nutritive status of the subjects. The procedure for collection and a description of the methods employed are included in Chapter IV, Procedures and Methods.

Protein Status

There was no evidence of an insufficiency of protein as judged from the total plasma protein, albumin, or globulin values of the 123 samples analyzed (Table 17). The high globulin values found (28.4 percent of the samples analyzed having plasma globulin values above 3.5 mg per 100 ml) are consistent with findings in other Asian countries (1, 2, 3).

Vitamin Status

Vitamin B-Complex

Thiamine. The thiamine excretion data show that some 23 percent of the military personnel were excreting less than 27 μg of thiamine per gram of creatinine (Table 18). This level of excretion is considered to indicate an

TABLE 17. TOTAL PLASMA PROTEIN, ALBUMIN AND GLOBULIN LEVELS AND ALBUMIN/GLOBULIN RATIO, MILITARY SAMPLE, MALAYA

gm/100 ml

Description	Number of Subjects	Mean ±S.E. 1/	Percent Distribution "Deficient"	"Low"	"Acceptable"	"High"
			(<6.00) 2/	(6.00-6.39)	(6.40-6.99)	(≥7.00)
Total Plasma Protein	123	7.3 ± 0.05	0	3.2	29.3	67.5
			(<2.5)	(2.5 -3.4)	(3.5 -5.0)	(>5.0)
Albumin	123	4.0 ± 0.04	0.8	8.1	91.0	0
			(<2.0)	(2.0 -2.9)	(3.0 -3.5)	(>3.5)
Globulin	123	3.3 ± 0.06	0	34.1	37.4	28.4
			(<1.0)	(1.0 -1.4)	(1.5 -1.9)	(≥2.0)
Albumin/Globulin Ratio	123	1.27 ± 0.03	13.8	57.7	26.0	2.4

1/ S.E. = standard error.
2/ Values in parentheses are ICNND standard values for classification.

TABLE 18. URINARY THIAMINE, RIBOFLAVIN AND N'-METHYLNICOTINAMIDE LEVELS, MILITARY SAMPLE, MALAYA

Description	Number of Subjects	Median	Percent Distribution "Deficient"	"Low"	"Acceptable"	"High"
Thiamine Excretion			(<27) 1/	(27-65)	(66-129)	(≥130)
μg/gm creatinine	106	52	22.6	41.5	21.7	14.2
Riboflavin Excretion			(<27)	(27-79)	(80-269)	(≥270)
μg/gm creatinine	118	32	42.4	40.7	13.6	3.4
N'-methylnicotinamide Excretion			(<0.5)	(0.5-1.59)	(1.60-4.29)	(≥4.30)
mg/gm creatinine	95	4.2	1.0	3.2	47.4	48.4

1/ Values in parentheses are ICNND standard values for classification.

intake of the vitamin which would result in clinical deficiency if continued for a sufficient period of time. The median excretion of 52 µg per gram of creatinine is indicative of a low intake by the majority of the personnel studied. The finding of either "acceptable" or "high" excretion levels in some 36 percent of the individuals studied indicates that a portion of the troops was receiving adequate intakes of thiamine.

Riboflavin. The excretion of riboflavin was found to be in the "deficient" range for 42 percent of the personnel studied and "low" in some 41 percent (Table 18). The observation that only some 17 percent of the personnel studied showed excretion levels in the "acceptable" or "high" range indicates a generally suboptimal intake of this vitamin. The only location studied where the median excretion was in the "acceptable" range was Negri Sembilan (median excretion 94 µg per gram of creatinine) where only 4 percent of the personnel examined showed excretion levels in the "deficient" range (Appendix Table 25).

N'-Methylnicotinamide. The finding that some 96 percent of the samples analyzed for N'-methylnicotinamide fell within the "acceptable" or "high" range indicates an adequate intake of niacin or its precursors by the personnel studied (Table 18). The median excretion of 4.2 mg per gram of creatinine is well within the "acceptable" range.

Vitamin A

There was no evidence of inadequate vitamin A nutriture as judged from the 120 samples analyzed for vitamin A and carotene (Table 19). Some 97 percent of the samples were found to be in the "acceptable" or "high" range for vitamin A. In addition, all samples analyzed for carotene were found to be in the "acceptable" or "high" range.

Vitamin C

The mean plasma ascorbic acid value of 0.42 mg per 100 ml is indicative of an adequate intake of this vitamin. None of the 117 samples analyzed was found to be in the "deficient" range (Table 19).

Mineral Status

Anemia

The biochemical values obtained indicate that anemia is not a problem among the military personnel in Malaya. Less than one percent of the 125 samples analyzed showed a hemoglobin level of less than 12 gm per 100 ml. The values for plasma corpuscular volume and mean corpuscular hemoglobin concentrations also are indicative of the absence of anemia in the personnel examined (Table 20).

Iodine

More than half (62.3 percent) of the 53 individuals examined were excreting less than 50 µg of iodine per gram of creatinine, an amount considered to be inadequate (Table 21). These data suggest the need for an increased intake of iodine.

TABLE 19. PLASMA VITAMIN A, CAROTENE AND ASCORBIC ACID LEVELS, MILITARY SAMPLE, MALAYA

Description	Number of Subjects	Mean ±S.E. 1/	Percent Distribution "Deficient"	"Low"	"Acceptable"	"High"
Vitamin A µg/100 ml	120	45.3 ± 1.2	(<10) 2/ 0.8	(10-19) 2.5	(20-49) 58.3	(≥50) 38.3
Carotene µg/100 ml	121	97 ± 3	(<20) 0	(20-39) 0	(40-99) 62.0	(≥100) 38.0
Vitamin C mg/100 ml	117	0.42 ± 0.02	(<0.10) 0	(0.10-0.19) 12.8	(0.20-0.39) 47.0	(≥0.40) 40.2

1/ S.E. = standard error.
2/ Values in parentheses are ICNND standard values for classification.

TABLE 20. HEMOGLOBIN, PLASMA CORPUSCULAR VOLUME (HEMATOCRIT) AND MEAN CORPUSCULAR HEMOGLOBIN CONCENTRATION, MILITARY SAMPLE, MALAYA

Description	Number of Subjects	Mean ±S.E. 1/	Percent Distribution "Deficient"	"Low"	"Acceptable"	"High"
Hemoglobin gm/100 ml blood	125	15.7 ± 0.14	(<12.0) 2/ 0.8	(12.0-13.9) 9.6	(14.0-14.9) 16.8	(≥15.0) 72.8
Plasma Corpuscular Volume percent	122	44.9 ± 0.29	(<36) 0	(36-41) 16.4	(42-44) 25.4	(≥45) 58.2
Mean Corpuscular Hemoglobin Concentration percent	122	35.0 ± 0.25	(<28) 1.6	(28.0-29.9) 0	(30.0-31.9) 4.9	(≥32.0) 93.4

1/ S.E. = standard error.
2/ Values in parentheses are ICNND standard values for classification, except for mean corpuscular hemoglobin concentration.

TABLE 21. URINARY IODINE EXCRETION, MILITARY SAMPLE, MALAYA

Description	Number of Subjects	Mean	Percent Distribution		
Iodine Excretion			(<50)1/	(50-99)	(≥100)
μg/gm creatinine	53	47	62.3	34.0	3.8

1/ This is a level below which excretions are considered to be indicative of an inadequate intake.

Plasma Lipids

Because of the possible significance of plasma lipids in coronary disease, cholesterol, lipid phosphorus and β-lipoproteins were determined (Table 22). Interpretation of these data, however, is difficult since the incidence of coronary disease in Malaya is remarkably low when compared with Western standards. The lipid values found in Malayan military men would seem to be in accord with existing hypotheses concerning cholesterol and heart disease.

TABLE 22. PLASMA CHOLESTEROL, LIPID PHOSPHORUS AND β-LIPOPROTEIN LEVELS, MILITARY SAMPLE, MALAYA

Description	Mean ± S.E.1/	Number of Subjects
Cholesterol mg/100 ml	180 ± 4.0	121
Lipid phosphorus mg/100 ml	10.2 ± 0.19	121
β-Lipoprotein mm	3.0 ± 0.06	113

1/ S.E. = standard error.

In summary, there was no evidence of protein insufficiency. There was a suggestion of a relatively low intake of thiamine in some 23 percent of the military personnel. Excretion of riboflavin likewise was low in 42 percent, but the rate of excretion of N'-methylnicotinamide was "acceptable" or "high" in a majority of those studied. Vitamin A and carotene levels in the plasma were judged to be adequate as was vitamin C. Anemia was not a problem in military personnel. Iodine was excreted in low quantities by over half of the 53 individuals so examined. The prevalence of goiter was, however, very low in the military men (0.6 percent) and hence there was no apparent correlation between these two findings. Plasma lipids were measured because of any possible correlation between these values and clinical heart disease. It is of interest to observe that cholesterol values were remarkably lower than those of American troops. (Other biochemical data are given in Appendix Tables 25, 26 and 27).

TABLE 23. THE ORAL HEALTH STATUS OF MILITARY MALES BY AGE, FEDERATION OF MALAYA, 1962

Age	DMF[1]		PI[2]		Attrition		Recession		Debris		Calculus		OHI[3]	
(years)	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean
15-19	46	3.89	46	0.186	46	0.958	46	0.4	46	1.200	46	0.761	46	1.961
20-24	221	4.25	221	0.183	221	0.987	221	1.9	221	1.013	221	0.722	221	1.735
25-29	104	5.57	104	0.417	104	0.970	104	6.9	104	1.024	104	0.900	104	1.924
30-34	65	6.10	64	0.672	64	1.084	64	11.2	64	1.108	64	1.064	64	2.172
35-39	23	5.95	23	1.148	23	1.156	23	22.1	23	1.256	23	1.130	23	2.387
40-44	1	9.00	1	2.100	1	0.600	1	42.0	1	1.200	1	0.800	1	2.00
Total and Mean	460	4.88	459	0.357	459	1.001	459	5.2	459	1.060	459	0.834	459	1.894

1/ Diseased, missing, filled.
2/ Periodontal Index.
3/ Oral Hygiene Index.

TABLE 24. THE ORAL HEALTH STATUS OF MILITARY MALES BY AREA OF ORIGIN, FEDERATION OF MALAYA, 1962

Area of Origin	DMF[1]		PI[2]		Attrition		Recession		Debris		Calculus		OHI[3]	
	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean
Selangor	44	4.89	44	0.395	44	0.898	44	4.2	44	1.145	44	0.793	44	1.938
Kelantan	21	4.81	21	0.262	21	1.167	21	12.4	21	1.024	21	0.919	21	1.943
Pahang	13	3.29	14	0.286	14	0.850	14	7.1	14	1.171	14	1.107	14	2.278
Johore	66	5.03	65	0.249	65	0.906	65	4.1	65	1.080	65	0.752	65	1.832
Malacca/Negri Sembilan	133	5.30	133	0.316	133	1.015	133	4.4	133	1.059	133	0.802	133	1.862
Perak	106	4.74	106	0.400	106	1.064	106	5.1	106	1.017	106	0.828	106	1.845
Kedah	40	4.90	40	0.472	40	1.082	40	5.4	40	1.097	40	0.900	40	1.997
Trengganu	9	6.78	9	0.444	9	0.944	9	3.3	9	0.855	9	0.789	9	1.644
Penang	19	5.21	19	0.321	19	0.900	19	8.8	19	0.932	19	0.905	19	1.837
All others	8	3.25	8	0.925	8	1.038	8	7.3	8	1.263	8	1.213	8	2.475

1/ Diseased, missing, filled.
2/ Periodontal Index.
3/ Oral Hygiene Index.

Dental

The oral health status of military males in Malaya is shown by age in Table 23, by area of origin in Table 24, and by race in Table 25. A comparison is made in Figure 11 of the mean diseased, missing, and filled (DMF) status of Malayan military males and military personnel of Thailand (1), South Vietnam (2), Republic of China (5) and Burma (3). There were insufficient examinees in Malaya to draw conclusions concerning the oral health in the 40 to 44 year age group. The mean DMF of military personnel in Malaya ranged from 3.89 in the 15 to 19 year age group to 6.10 in the 30 to 34 year age group. The rate of rise of mean number of DMF with age in Malayan military personnel was irregular and not very high between 15 and 50 years of age. There is generally a slow rate of rise of DMF with age in military personnel (Figure 11), in contrast to American or Malayan civilians where the rate of rise is rather steep (Figure 19).

TABLE 25. THE ORAL HEALTH STATUS OF MILITARY MALES ACCORDING TO RACE, FEDERATION OF MALAYA, 1962

Oral Condition	Race: Malayan No.	Malayan Mean score	Chinese No.	Chinese Mean score	Other No.	Other Mean score
DMF1/	410	4.65	31	8.16	19	4.42
PI2/	409	0.374	31	0.213	19	0.237
Attrition	409	1.024	31	0.900	19	0.679
Recession	409	5.6	31	3.1	19	2.0
Debris	410	1.060	31	1.087	19	1.026
Calculus	409	0.862	31	0.554	19	0.695
OHI3/	409	1.922	31	1.642	19	1.721

1/ Diseased, missing, filled.
2/ Periodontal Index.
3/ Oral Hygiene Index.

Clinical dental fluorosis was not found in native-born and -reared Malayan military personnel, a factor having some influence on the extent of the dental caries. The mean Periodontal Index (PI) for military males in Malaya increased steadily from 0.186 in the 15 to 19 year age group to 1.148 in the 30 to 39 year age group. In Table 26, the PI in military males in Malaya is compared with that found in military males in Thailand, Vietnam, the Republic of China and Burma. Attrition in Malayan military males increased steadily with age, to reach a high of 1.156 in the 35 to 39 year age group. The fluoride content of drinking water samples from 29 examination sites and the fluoride content of composite urine samples from 30 examination sites are shown in Table 27. With the exception of three examination sites, the fluoride content of drinking water was generally low or insignificant. On the other hand, most of the urinary outputs of fluoride indicate that more fluoride is being excreted than can be accounted for in drinking water. With such levels of urinary output of fluoride, it might be expected that clinical dental fluorosis would be reasonably high, in contrast to its complete absence in native-born and -reared individuals in Malaya.

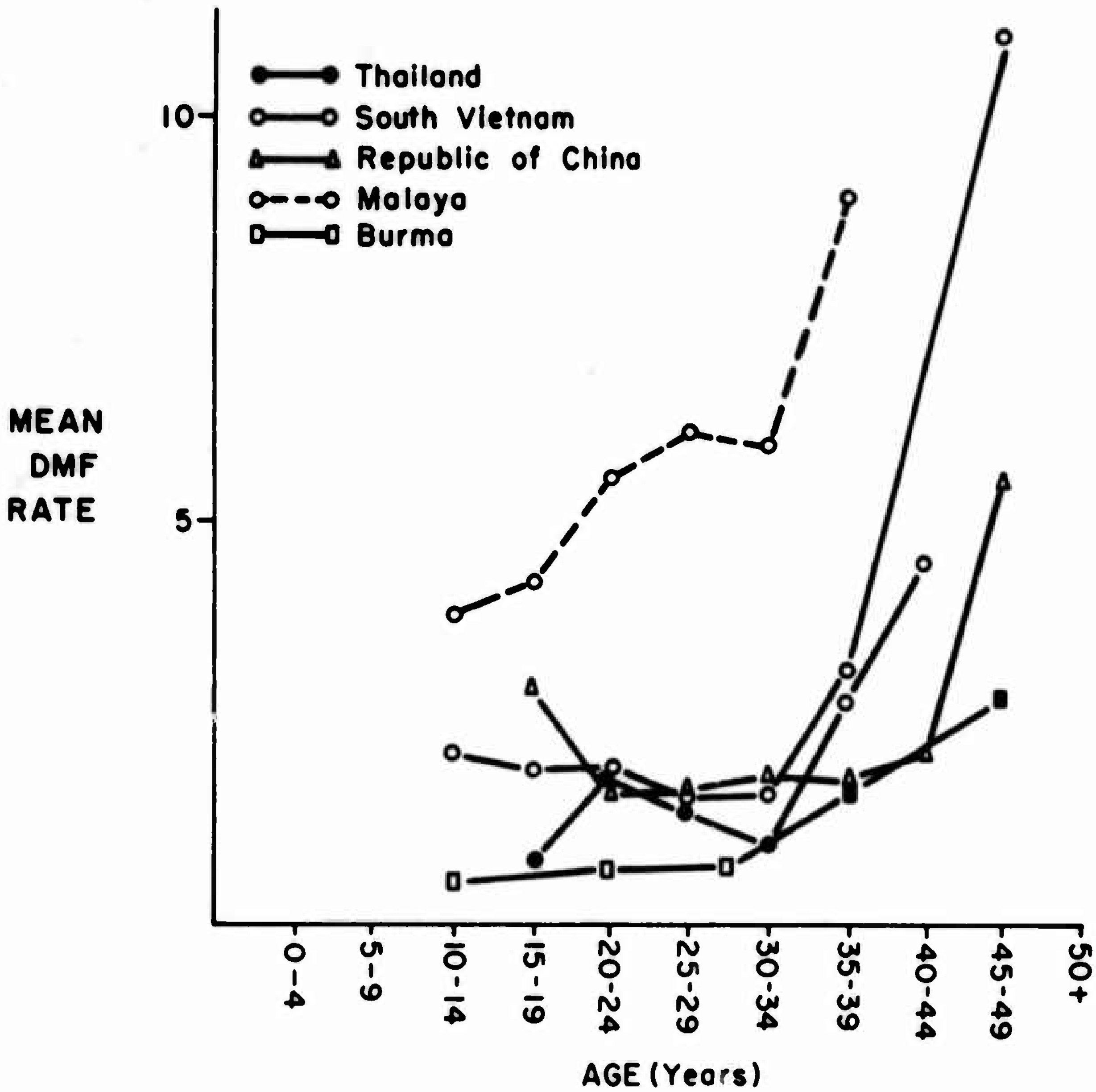

FIGURE 11. A COMPARISON OF THE DMF RATES OF MILITARY MALES IN MALAYA, THAILAND, SOUTH VIETNAM AND BURMA

TABLE 26. COMPARISON OF THE PERIODONTAL INDICES OF THE MILITARY MALES OF SOUTHEAST ASIA COUNTRIES[1/]

Age (years)	Country: Malaya	Thailand (1)	Vietnam (2)	Republic of China (5)	Burma (3)
15-19	0.18		0.52	0.20	0.52
20-24	0.18	0.68		0.35	0.79
25-29	0.41	0.65	0.65	0.42	
30-34	0.67	0.77		0.70	1.51
35-39	1.15	0.72	0.74	0.72	
40-44	2.10	1.27		1.13	2.92
45-49		2.15	2.60	1.38	
50+		8.00		3.30	3.91

1/ Numbers in parentheses refer to references.

Recession in Malayan military males increased steadily with age, reaching 22.1 in the 35 to 39 year age group. Debris remained relatively constant with age but there was some increase in calculus with age. The oral hygiene index (OHI) of military males reached 2.387 in the 35 to 39 year age group, 6.0 being a maximum possible score. A comparison is made in Table 28 of the oral hygiene indices of the military males of several Southeast Asia countries.

In comparing military males as to area of origin (Table 24) no particular area was either high or low with regard to all oral conditions. Within the states of Malaya, men coming from Trengganu had the highest mean DMF rate (6.78) and those from Pahang had the lowest (3.29); men from Kedah had the highest PI (0.472) and those from Johore had the lowest (0.249); men coming from Kelantan had the highest attrition score (1.167) and those from Pahang had the lowest (0.850); Kelantan men had the most recession (12.4) and those from Trengganu the lowest (3.3); men coming from Pahang had the most debris (1.171) and those from Trengganu the least (0.855); those from Pahang had the most calculus (1.107) and those from Johore the least (0.752); and men originating in Pahang had the highest OHI (2.278) and those coming from Trengganu the lowest (1.644).

A comparison of military males according to race (Table 25) shows that the mean DMF of the Chinese (Buddhists) (8.16) was essentially twice that of the Malayan (Moslems; 4.65) or of all other races (4.42). The PI score was higher for Malayans but not greatly different than it was for those of other races. Attrition, recession, debris, calculus and OHI did not vary greatly among the three racial groups, all except debris being higher in the Malayans than in the other groups. There was more debris among the Chinese than in the other groups.

TABLE 27. FLUORIDE CONTENT OF WATER AND URINE SAMPLES COLLECTED IN THE FEDERATION OF MALAYA, 1962

State	Village or other specific location	ppm[1/] Water	ppm[1/] Urine
Selangor	Ft. Escandar	0.04	0.10
Selangor	Batu	0.14	0.80
Selangor	Sentul		0.36
Selangor	Suleiman Courts	0.14	0.60
Selangor	Kampong Bheru	0.14	0.70
Selangor	Surgei Merap Sekalah	0.18	1.40
Kelantan	Battn, RMR[2/]	0.04	0.70
Kelantan	T. Tinggi	0.34	2.36
Kelantan	Ching Chan School	0.14	0.50
Kelantan	Kampong Melor	0.04	0.76
Kelantan	Mulong	0.08	0.60
Pahang	Battn, RMR	0.04	
Pahang	Lubok Terua (Malay school)	0.08	
Pahang	Tg. Kerayong	1.40	1.16
Pahang	Chung Hwa	0.28	0.66
Johore	Kampong Melagu (school)	0.08	0.30
Johore	Mengkibol		1.34
Johore	Battn, RMR	0.40	1.50
Johore	Kluang	0.00	2.50
Johore	Sri Lanlang	0.04	
Malacca	RECCE, RMR	0.04	1.06
Malacca	Kesangtha		0.30
Malacca	Tg. Keling (Malay school)		0.76
Negri Sembilan	Port Dickson	0.08	1.26
Perak	Battn, RMR	0.64	2.50
Perak	Batu Gajah	1.00	2.30
Perak	Ben Ban School		
	Ben Ban Community Center	1.72	1.48
Perak	Pusing Village	0.18	1.60
Perak	Ampang Bahru	0.04	5.00
Perak	Kampong Bercham (Chinese school)	0.04	1.36
Kedah	Alor Star High School	0.86	0.40
Kedah	Kampong Gunong (Malay school)	0.20	1.14
Kedah	Battn, RMR	0.40	0.94

1/ ppm = parts per million.
2/ Royal Malay Regiment.

Dental caries were less prevalent in military personnel than in civilian groups, and similarly periodontal disease was least prevalent among military groups. Much of this may have been due to the selective factor introduced by induction physical examinations.

TABLE 28. A COMPARISON OF THE MEAN ORAL HYGIENE INDEX OF MILITARY MALES OF SOUTHEAST ASIA COUNTRIES[1/]

Age (years)	Malaya	Thailand (1)	Burma (3)	Republic of China (5)
15-19	1.96		1.83	1.20
20-24	1.73	2.54	1.92	2.25
25-29	1.92	2.04		2.36
30-34	2.17	2.30	2.36	2.78
35-39	2.38	1.62		2.84
40-44	2.00	2.16	2.99	3.10
45-49		2.38		3.36
50+		6.00	4.43	3.30

1/ Numbers in parentheses refer to references.

Dietary

The dietary team consisted of one nutritionist from the United States and one from the Royal Malay Army (AFMC). Additional help was obtained as needed at each of the survey sites.

Dietary surveys were conducted at six separate Army units. These were Battalions A, B, C, D and E of the Royal Malay Regiment and an RECCE (Federation Reconnaisance Corps). Each of these units was in a different Malayan state and consequently together they are geographically representative of the country. In addition two supply depots, the Federation Military College and an installation where military recruits are trained, were visited.

Food Intake Procedures

Food consumption at the military installations was determined by both the recipe method (food preparation and consumption method) and the chemical method using food composite samples.

The recipe method converts edible prepared food back to its raw equivalent of fresh food as served per person. This is accomplished by weighing the raw food, the edible food, and the food which is not consumed. It is of course necessary to obtain an accurate head count in order to determine the amounts served per person. The nutrients, including protein, carbohydrate, fat, calcium, iron, and the various vitamins, are then calculated using appropriate food composition tables. Tables which were utilized in this survey are listed in the references at the end of Chapter IV (12-18).

The chemical composite method involved weighing all of the prepared food and discarded food and determining by head count the average intake per person. A representative composite was then prepared and properly preserved following each meal. Duplicate samples were preserved with either oxalic acid or alcoholic potassium hydroxide to which chloroform had been added as described (8). The food composites were shipped to the United States for analysis for protein,

fat, crude fiber, moisture, ash, carbohydrate (calculated by difference), calcium, iron, and vitamins A and C, thiamine, riboflavin and niacin. In addition, content of certain other vitamins, vitamin B_6, vitamin B_{12}, folic acid and pantothenic acid, for which the human requirements are not as yet as specifically determined, was ascertained.

Each chemical composite was made up during a two-day dietary survey. It was felt that such a sample was representative of the food consumed at each survey site, as the menu plan called for alternate issuing of meat and fish. Certain other samples of dietary interest were obtained for chemical analysis. These included rice from each of the units studied, water used in the preparation of foods at each unit, and items of possible interest as new ration components.

At each of the survey sites various places were visited to obtain information as to food supplies and storage, including the unit Ration Stores where staple and emergency rations were stored. In some units this was rather close to the mess hall. In others it was at a greater distance. When the contractor for fresh foods was local, his establishment was visited. Delivery of the fresh foods by the contractor was observed at each mess. The unit canteen was visited both to see the types of items sold which might contribute to the nutrients of the dietary and to determine the amount of patronage.

In most instances the bread consumed by the Malayan soldier was baked in the Cold Storage Bakery in Kuala Lumpur. A local bakery utilized in Kelantan was visited. The local market where the fresh foods were obtained was observed for the kinds of fruits, vegetables, meat and fish which were sold. This indicated the kinds of foods which were available for the troops' menu and for use by the families of married soldiers. Information was also gathered on food preparation, messing practices, dietary patterns and mess hall facilities.

Malayan Troops Ration Scale - Basis of Issue

The ration scale of the Armed Forces of the Federation of Malaya contains 29 categories. It gives the daily scale in ounces as well as the number of weekly issues and the total number of issues per month (Table 29). The items which make up each category are generally similar in composition and may be more than one in number. For instance, category one is composed of bread and biscuits; category 2 of meat, fresh fish, dried fish and poultry; category 3 liver. There are eleven different spices in category number 24. This method of classification is probably reasonable for the distribution of the food items. However, the foods in each of the classifications listed are not necessarily nutritionally equivalent.

Provision is made in the ration scale to substitute for the Chinese Malayan soldiers certain soybean products for dried fish and spices. A similar provision is made for the Indian Malayan soldiers who are issued extra ghi and dhall for dried fish, etc. The ration scale also provides one issue of pork per week (eight ounces per man) which could be issued for non-Moslem troops in lieu of one issue of meat, fresh and boneless. Other exceptions in the ration due to religious restrictions or racial preference include the issue

TABLE 29. BASIS OF ISSUE, MALAYAN TROOPS RATION SCALE, ARMED FORCES OF THE FEDERATION OF MALAYA

Serial No.	Commodity	Daily scale (oz)	Weekly issue				Total issues
			A	B	C	D	
1.	a Bread	4	7	6	7	6	26
	b Biscuits, service, plain	3	-	1	-	1	2
2.	a Meat, fresh, boneless (or meat, fresh, bone-in at 8 oz)	6	3	3	2	3	11
	b Stewed meat, tinned, halal	8	1	-	1	1	3
	c Fish, fresh (uncleaned)	8	2	3	3	3	11
	d Fish, dried	6	-	1	1	-	2
	e Poultry	10	1	-	-	-	1
3.	Liver	3	-	1	-	1	2
4.	a Potatoes, fresh	3	7	6	6	6	25
	b Potatoes, tinned	2	-	1	1	1	3
5.	a Vegetables, fresh	10	6	6	6	7	25
	b Vegetables, tinned	4	1	1	1	-	3
6.	Fruit, fresh	6	7	7	7	7	28
7.	Rice	16	7	7	7	7	28
8.	a Tea	1/3	6	6	6	6	24
	b Coffee	1	1	1	1	1	4
9.	Lemonade/orangeade powder	3/4	1	1	1	1	4
10.	Sugar	3	7	7	7	7	28
11.	Milk, tinned	3	7	7	7	7	28
12.	Eggs (numbers)	1	7	7	7	7	28
13.	Salt	1/2	7	7	7	7	28
14.	Soya bean ketchup	1/4	7	7	7	7	28
15.	Onions, small red	1/7	7	7	7	7	28
16.	Jam	1/4	7	7	7	7	28
17.	Flour	1	7	7	7	7	28
18.	Vinegar, fluid oz	1/14	7	7	7	7	28
19.	Coconut (with shell and milk)	4	7	7	7	7	28
20.	a Coconut oil	1 1/2	7	6	7	6	26
	b Ghi	1 1/2	-	1	-	1	2
21.	a Margarine, pure vegetable, wrapped	3/5	5	5	5	5	20
	b Margarine, pure vegetable, tinned	2/3	2	2	2	2	8
22.	Shrimp paste	1/28	7	7	7	7	28
23.	Prawns, dried	1/7	7	7	7	7	28
24.	a Jintan manis	1/50	6	7	6	6	25
	b Halba	1/50	6	7	6	6	25
	c Cinnamon	1/50	6	7	6	6	25
	d Turmeric	1/50	6	7	6	6	25
	e Bunga chengkeh	1/200	6	7	6	6	25
	f Buah pelaga	1/50	6	7	6	6	25
	g Black pepper	2/25	6	7	6	6	25
	h Biji sawi	1/50	6	7	6	6	25
	i Kas-kas	1/25	6	7	6	6	25
	j Bunga lawang (see note 5)	1/50	6	7	6	6	25
	k Curry powder	1/2	1	-	1	1	3

TABLE 29 (Continued) BASIS OF ISSUE, MALAYAN TROOPS RATION SCALE, ARMED FORCES OF THE FEDERATION OF MALAYA

Serial No.	Commodity	Daily scale (oz)	Weekly issue A	B	C	D	Total issues
25.	Fresh ginger	1/7	7	7	7	7	28
26.	Garlic	1/14	7	7	7	7	28
27.	a Chillies, fresh	3/4	3	3	3	3	12
	b Chillies, dried	1/6	4	4	4	4	16
28.	Tamarind	1/7	7	7	7	7	28
29.	Coriander seed	1/14	7	7	7	7	28

CHINESE MALAYANS
The following may be drawn in lieu of serials 22, 23, 24, 28 and 29:

30.	a Soya bean curd	3/4	3	4	3	4	14
	b Soya bean paste	3/7	4	3	4	3	14
31.	Soya bean ketchup (fluid oz)	1	7	7	7	7	28

INDIAN MALAYANS
The following may be drawn in lieu of serials 20-23 (inclusive):

32.	Ghi	2	7	7	7	7	28
33.	Dhall	2	7	7	7	7	28

NOTES:

1. One issue of pork (bone-in) per week at 8 oz may be drawn for non-Moslem troops in lieu of one issue of meat, fresh, boneless.
2. A cash allowance to cover the issue of fruit, fresh, and eggs will be authorized if these items are not available for issue when the tinned equivalent ration is issued.
3. Six oz of atta may be drawn per day for Indian Malayan troops only in lieu of 6 oz rice.
4. Lemonade/orangeade powder will be issued once per week only except when authorized for daily issue as supplement "F."
5. Bunga lawang (fresh ginger) will not be issued while the Federation Government's ban on its importation is in force.
6. In units with multiracial cookhouses, mutton jatka may be drawn for Malayan Indian troops.
7. In the case of personnel of the Royal Malayan Navy while serving afloat, the following deviation is authorized wef 1 Jul 61:
   Serial 8
   When coffee is issued the scale will be reduced from 1 oz to 1/2 oz.
8. One issue of tinned soup per man per day on the scale of half a tin (not to exceed 8 oz) may be issued to all troops engaged on operations in the jungle under arduous conditions, in ambush positions or on training in monsoon or other bad weather conditions.

TABLE 29 (Continued) BASIS OF ISSUE, MALAYAN TROOPS RATION SCALE, ARMED FORCES OF THE FEDERATION OF MALAYA

Supplement "A"	For issue to recruits undergoing training at Recruit Training Center. a Tea 1/6) b Sugar 1/2) To make one pint of tea c Milk tinned (U.K. or DOM) 4/5)
Supplement "B"	Special issues may be authorized by Ministry of Defense, Kuala Lumpur, to meet special fatigue, bad weather conditions or recurrent guard duties, on recommendation of local military commander (not below the rank of Lieutenant Colonel) supported by a medical officer: a Tea 1/4 oz) b Sugar 1/2 oz) per day c Milk, tinned 1 oz) When Supplement "B" is authorized for watchkeepers, Royal Malayan Navy, 1/2 oz of coffee will be issued in lieu of 1/4 oz of tea.
Supplement "C"	Special issues of the following may be authorized by Ministry of Defense, Kuala Lumpur for the following ration items for issue to lead paint sprayers, battery handlers and battery repairers, on the recommendation of an OC Workshops: Milk, fresh (or milk, tinned, at 4 oz) 1/2 pint per day
Supplement "D"	For issue to boys undergoing training at the Federation Military College: Milk, fresh (or milk, tinned, at 4 oz) 1/2 pint per day or 1 pint per day to undernourished recruits on individual medical recommendation only.
Supplement "E"	For issue to Moslem personnel only during Bulan Puasa, per man per day: Dates 4/7 oz Syrup 1/2 fluid oz Ice, as required to maximum of 8 oz
Supplement "F"	Special issue of lemonade/orangeade powder may be authorized by Hq. Federation Supplies and Transport Services (AFMC), to make up the scale of issue to a daily entitlement of 3/4 oz (instead of once weekly) for troops engaged in engineer works, road building or similar duties which subject soldiers necessarily to working long hours in the sun, on recommendation of the local military commander (not below the rank of Lieutenant Colonel) supported by a medical officer.

of mutton for Malayan Indian troops, as well as six ounces of atta (wheat) to replace six ounces of rice. As the great majority of the Army is of the Malayan race these substitutions constitute only minor alterations in the ration scale. In addition they do not significantly alter to any extent the nutritive composition of the ration "as issued." When the nutrients of the ration are calculated using the appropriate tables of composition, all are found to be in the "acceptable" or "high" intake range as indicated by the reference guides found in the ICNND Manual (Table 30; Appendix Table 30; ref. 8).

TABLE 30. COMPARISON OF DAILY NUTRIENT INTAKE BY THREE METHODS, MILITARY, MALAYA

Nutrient	Recipe Method 1/	Food Composite Analysis 2/	Basic Ration 3/	"Acceptable" Levels ICNND 4/
Calories	3,041	2,827	3,921	2,800-3,000
Protein, gm	79	99	104	60-90
Fat, gm	99	59	121	--
Carbohydrate, gm	456	477	622	--
Calcium, mg	476	463	651	400-600
Iron, mg	19	26	28.6	9-12
Vitamin A, IU	6,778	1,850	8,526	3,500-5,000
Thiamine, mg	0.78	<0.60	1.77	1.0-1.5
Riboflavin, mg	1.08	1.11	1.61	1.2-1.5
Niacin, mg	11.5	16.5	27.0	10-15
Vitamin C, mg	76	24	147	30-50

1/ Average of 6 locations, 840 men/2 days (includes corrections for cooking losses). (See Appendix Table 28).
2/ Average of 6 locations, 840 men/2 days. (See Appendix Table 29).
3/ Armed Forces of the Federation of Malaya, Malayan troops ration scale.
4/ From Manual for Nutrition Surveys (1st edition, 1957) as adapted for use in Burma survey (3). See Appendix Table 30.

The type and quantities of food shown on the Armed Forces ration scale are determined by a Ration Scales Committee composed of representatives from the departments of the Ministry of Defense concerned with provisioning, catering, finance and medical aspects, plus representatives of all three services. Since all three services use the same ration scale inclusion of a representative from each service is necessary.

A catering Warrant Officer will soon be available to help the various units in the preparation of the ration.1/ There is a British catering school in Singapore to which the mess personnel may be sent. The courses offered by this school are described on p. 82.

1/ The following catering personnel have been appointed to the Headquarters Federation Supplies and Transport Services since the survey was made: 1 Captain (seconded), 1 Lieutenant (Malaysian), 2 Warrant Officers (Malaysian).

The cost of the ration is determined after the letting of an annual contract for supplying certain of the ration items. For this purpose Malaya is divided into northern and southern regions. Certain ration exceptions are permitted, notably in locations where the monsoon season limits the production and distribution of certain items. Specifically, it permits the substitution of meat for fish and the issuing of more cabbage than is ordinarily permitted in the ration in lieu of other vegetables. At present the staple foodstuffs in the ration cost approximately 45 cents per man per day and the "fresh foodstuffs" in the ration cost $1.00 per man per day. Of nutritional interest is the fact that there are no seasons for vegetables as they are available the year around. This, however, is not true with fresh fruits which have a rather definite season, with the exception of bananas which are usually available at all times.

Specifications for a number of the items which make up the ration have been provided by the Armed Forces of the Federation of Malaya, Headquarters Federation Supplies and Transport Services (AFMC). These are staple ration items which are contracted for long periods of time and which are stored in the central warehouses and shipped to the units periodically. These specifications contain a description of the commodity concerned, its composition, limitations, and descriptions such as size, shape, fortification, limiting fat content, etc. They also include a description of the containers in which these commodities should be purchased. If in tin cans, the sealing, headspace, printing on the cans, lacquering, etc., are described. The specifications also provide for the packing and labeling of the item concerned with its expiration date. This makes it easy to issue the items before they are spoiled. Provision for testing samples of the various items is also included.

Many of the items have specifications which are of considerable nutritional importance. For instance, the flour specifications include enrichment by the addition of chalk, iron, vitamin B_1 (thiamine) and niacin to the standards prescribed by the Flour Regulations, 1956, of the United Kingdom. These specifications also indicate the minimum acceptable protein content of the flour together with provisions to insure its cleanliness. The requirements as stated for tinned stewed meats halal, curried and noncurried, indicate that only the best quality meat shall be used with not more than 10 percent fat. The manufacturers' warranty of good condition must be for a minimum period of two years in a hot climate.

It is interesting to note that the specification for milk, condensed, full cream, unsweetened, does not make provision for any supplementation. However, the specifications given for tinned pure vegetable margarine include a statement that it shall contain not less than 20 IU of vitamin A per gram and not less than 1.1 IU of vitamin D per gram. Another item of specific nutritional interest is the lemonade or orangeade powder, sweetened. This is a vitamin C supplement to the ration and was observed to be very acceptable. When one and one-half ounces of this lemonade powder are added to one pint of water it will provide 25 mg of ascorbic acid. The specifications for biscuits, service, plain, indicate that the flour used in their preparation shall be fortified.

The contractor who obtains the contract for the "fresh" rations also has certain specifications for the items which he provides. In general, the vegetables shall be fresh, of good size and quality, and contain a minimum of debris. The contractor is permitted some leeway in his selection of fresh vegetables. However, during a twenty-eight day period, the composition of the fresh vegetables supplied must be 10 percent each for cucumbers, tomatoes, french beans, long beans, mustard greens and lady fingers (okra) and 20 percent each for onions and cabbage. By and large, the fresh vegetables delivered at the mess during this survey met the specifications of the "fresh ration."

There are 58 different items listed in the specification for "fresh rations" and miscellaneous supply items. The specifications for fresh fruits include good quality, proper ripeness and sweetness, size, etc. Specifications for meats include the proper religious requirements, inspection by a local civilian veterinarian or meat inspector, requirement that the meat be boneless and equal proportion hind and fore quarters, and that it be delivered in a sanitary manner. Fish delivered to the mess has to be iced. Poultry which, according to the menu, is issued only one day a month is delivered alive not less than 2 1/2 lbs live weight nor more than 18 months of age.

Specifications for eggs are that they be fresh, of good quality, and more than 2 ounces each in weight. This latter requirement appeared to be one of the most difficult for the fresh food contractors to meet, as the eggs observed in the markets were generally smaller than 2 ounces. The specifications for fresh frozen margarine were that it be of good quality, free from rancidity, etc., and fortified with vitamins A and D. Specifications were also made for the miscellaneous items of the fresh ration to insure that their quality would be acceptable to the troops.

The Malayan Army has an operational ration used for emergency feeding. A description of the commodities which are used in this Charwick MK II Two-Man Pack Type "A" (two-man composite) ration is found in Table 31. The nutrient composition of this ration when calculated from food composition tables (using Army specifications for the commodity concerned) is found in Table 32. Also included in this table for purposes of comparison are the chemical analyses of this ration. Table 33 gives the nutrient composition of this ration on a 100 gm ration basis. This table is indicative of the nutrient density of the ration.

There is good agreement for the most part between the calculated and the chemically determined results. It may be noted that the chemical values for calcium and iron are considerably higher than the calculated ones. This undoubtedly is due to cooking procedures prior to canning, at which time the food obtains iron from the cooking utensils. Of unusual note is the fact that the vitamin C content by chemical analysis is about twice as high as the calculated values. According to chemical analysis about 20 mg of vitamin C were contributed by the stew meat portions of the ration. It is extremely doubtful that this portion of the ration could contribute ascorbic acid to this extent. It is possible that something added to the stew meat could react in the chemical determination to give false results indicating the presence of such an amount of vitamin C. It is much easier to explain the higher values for vitamin A, as calculated, as no cooking losses were taken into consideration in the recipe method.

TABLE 31. CHARWICK MK II 2-MAN PACK TYPE "A" (TWO-MAN COMPOSITE) RATION, MILITARY, MALAYA
(1 Man's Ration for 2 Days or 2 Men's Ration for 1 Day)

Commodity	Scale	Total Weight oz
Biscuits, service	3 x 2 men	6
Curried beef halal	4 x 2 men	8
Curried mutton halal	4 x 2 men	8
Vegetables, tinned	5 x 2 men	10
Fruits, tinned	4 x 2 men	8
Rice	14 x 2 men	28
Tea	1/2 x 2 men	1
Lemonade/orangeade powder	3/4 x 2 men	1 1/2
Sugar	1 1/2 x 2 men	3
Milk, tinned (sweetened condensed)	2 3/4 x 2 men	5 1/2
Salt	1 x 2 men	2
Jam	1 1/2 x 2 men	3
Vitamin tablets	1 x 2 men	2 tablets
Antimalarial tablets (to be issued by medical branch)		
Toilet paper	4 x 2 men	8 sheets
Matches	1 packet	1 packet

"Polythene containers, nonreturnable"

Total weight of 2 rations approximately 6 lbs 8 oz

This ration was assembled at the Headquarters, Federation Supplies and Transport Services. It was then transported to the supply depot where it was stored in an Armed Forces supply unit until issued for jungle operations on the border of Thailand. The rations were issued weekly to these troops (operation Bamboo Air Support). The type of activity of these troops determined the type of rations that these soldiers would receive. A static patrol would be issued two fresh rations and five tinned rations per man per week. A smaller patrol with a base camp would have three of the tinned rations replaced by the two-man composite rations. Patrols staying in the drop zone one day only and then moving forward would receive one fresh ration and six of the two-man composite rations. Patrols moving rapidly each day would receive the latter ration only. These rations were compact and rather easy to carry. However, it was said that after three days the troops would rather receive other rations. Fresh and tinned rations were being issued whenever possible to these soldiers.1/ When the vitamin supplement is included, the nutrients in this emergency ration are in the "acceptable" to "high" ranges as indicated by the suggested guide to interpretation of nutrient intake data of the ICNND (see Appendix Tables 30 and 31).

1/ Since the survey was completed the use of tinned rations has been discontinued. If fresh rations are not available, composite rations are provided. When troops are supplied by air the maximum number of days fresh rations are provided compatible with their task and the facilities for keeping food fresh. The balance is made up of composite rations.

TABLE 32. NUTRIENT VALUE OF CHARWICK MK II (TWO-MAN COMPOSITE) RATION, ROYAL MALAYAN ARMY, 1962

Nutrient	Chemical Analysis, Ration Only	Chemical Analysis, Vitamin Tablet	Chemical Analysis, Total (Ration + Vitamin Tablet)	Calculated from Food Composition Tables, Ration Only
Calories	2,803	--	2,803	2,684
Protein, gm	82	--	82	73
Carbohydrate, gm	526	--	526	508
Fat, gm	41	--	41	36
Calcium, mg	459	--	459	321
Iron, mg	53	--	53	12
Vitamin A, IU	500	5,650	6,150	1,090
Thiamine, mg	1.13	2.44	3.57	0.94
Riboflavin, mg	0.95	1.93	2.88	0.87
Niacin, mg	20.2	17.1	37.3	16.7
Vitamin C, mg	67.7	49.0	116.7	29.0

TABLE 33. NUTRIENT VALUE OF CHARWICK MK II (TWO-MAN COMPOSITE) RATION, ROYAL MALAYAN ARMY, 1962, PER 100 GRAMS OF RATION1/

Nutrient	Chemical Analysis2/	Calculated from Food Composition Tables2/
Calories	255	234
Protein, gm	7.5	6.4
Carbohydrate, gm	47.8	44.2
Fat, gm	3.7	3.1
Calcium, mg	41.7	28.0
Iron, mg	4.8	1.0
Vitamin A, IU	45	99
Thiamine, mg	0.10	0.08
Riboflavin, mg	0.09	0.08
Niacin, mg	1.84	1.45
Vitamin C, mg	6.15	2.53

1/ Total weight of ration, gm 1,100 1,148
2/ Vitamin supplement not included.

Certain supplements were authorized for issue to certain troops for specific purposes (Table 29). For instance, supplement "A" was issued to recruits undergoing training at a recruit training center, and consisted of the ingredients necessary to make one pint of tea. The sugar and milk of this supplement would be of nutritional merit. Supplement "B" was a similar ration which was authorized for those on recurrent guard duty on recommendation of the local military commander supported by the medical officer. Supplement "C" consisted of one-half pint of fresh milk per day or four ounces of tinned milk and was issued to lead paint sprayers, battery handlers and battery repairers. Supplement "D" was similar to supplement "C" and was issued to boys undergoing training at the Federation Military College.

Supplement "E" was issued to Moslem personnel only for certain religious festivals and consisted of dates, syrup and ice sufficient to make an 8-ounce drink. Supplement "F" consisted of additional amounts of lemonade-orangeade powder for troops engaged in engineer activities. This would be issued on the recommendation of the local military commander and supported by the medical officer. While these supplements are not of great significance, the items involved are of good nutritional quality and can be of benefit in supplementing the ration. It is to be emphasized that the only troops receiving fresh milk daily (not tinned) were those at the Federation Military College, recruits and the very few individuals classified as battery handlers.

Mess Areas and Messing Practices

The messing areas in general were all open with no screens. Some had lattice work partitioning the mess. Others had large ventilating fans, water fountains, tables and chairs. Some had curtains and pictures on the wall. Usually there was a corporals' mess located in one end of the messing area or in a separate building near the kitchen. Movies were shown at night in

most of the messing areas. By and large the messing areas were as clean as could be expected under the existing physical conditions.

The morning meal consisting of a piece of bread, boiled egg, tea, jam and margarine was served as a rule from 0630 to 0700 (am). The mid-day meal consisting of rice, a vegetable curry and a meat or fish curry was served between 1300 and 1400 hours. A similar meal of the same basic constituents was served in the evening after 1830 hours. Tea was served at 1600 hours together with either some baked product or fresh fruit.

The eating utensils used by the soldiers consisted of a large cup for tea at breakfast and in the middle of the afternoon. This same cup could be used for iced water for the other two meals together with a large dish on which the rice was served. Food was served to the men either by kitchen personnel or divided by the kitchen personnel into company portions. Each company then supplied its own personnel to distribute the food equally among the men. The mess personnel generally had white clothes for working in the mess. Considerable differences in the messing areas were apparent due to the physical features which varied from a permanent- to a temporary-type mess.

Cooking Areas

In the Malayan Army all of the mess personnel are members of the military (except at the Federation Military College; see p. 90). The importance of the military being able to provide for themselves became very apparent in the recent Congo duty of the Malayan Army. The Noncommissioned Officers who are the administrative personnel in the mess are graduates of the British Catering School in Singapore. They have taken a basic course in the preparation of food ("B3") which lasts for two months. After some time in their own battalion mess they then return for course "B2" which lasts for three weeks. Again after experience in their own battalion mess they are permitted according to roster to attend the advanced course "B1" which is again for a two-month period. A special course of two weeks is open only to the cook's sergeants. This course includes instruction in the duties of the mess sergeant, the use of forms, the drawing of rations, estimating troop strength, planning menus, and devising rosters for days off, etc. The catering school seemed to be well patronized by the messes which were observed in this survey. It is indeed fortunate that such a school is available, for it is here that the ground work in nutrition could be initiated.

A battalion mess consists of one sergeant, three corporals, three lance-corporals and seventeen privates. They have alternate days of duty starting at 8:00 am. The troops are taught kitchen hygiene at the catering school but a minimum of nutrition. This could be a good place to start nutrition education.

The cooking areas visited during the dietary survey varied from tile floors with built-in floor drains to rather rough concrete floors with one end of the kitchen open completely to the outside. The permanent-type messes with the tile floors were very similar to the messes which have been observed in the British Isles. In these messes the facilities were so large that only one half of the messing area was needed to prepare food for the present troops.

Consequently, after two months the other half of the area was used, permitting the first half to be thoroughly cleaned. Such large kitchens are not usual; perhaps three military units have such spacious messes.

Cooking was accomplished in some messes in large iron pots which were set in a cement base and fired with wood either from outside or inside of the mess. Still other messes had wood-fired pots centrally located in the mess with chimneys which were adequate for smoke removal. In other messes cooking was accomplished with steam, diesel oil, or electricity.

The permanent-type messes were those which had the more modern types of heating. In the temporary messes where the stoves were fired with wood from outside the mess, it rained so hard at times that it was difficult to keep the fires burning.

A problem which Malaya and this region of the world share particularly is the religious differences in food preparation for the various races constituting the Armed Forces. In one of the messes there was a "pork kitchen" which was used once a week to cook pork for certain non-Moslem troops. Pork had to be cooked outside of the regular mess and could not even be stored in the mess refrigerator with the other meat or fish. Similarly, on the other side of this particular mess was a "japati kitchen" which was used daily to prepare japatis for the Indian troops who were part of the station personnel. This problem of different races eating from the same kitchen was noted primarily in only three messes, an RECCE, the Federation Military College, and the center where recruits were trained.

Although many different cooking devices were used, all of the mess personnel seemed able to cope with their equipment in order to turn out their meals at the proper time. The main problems noted were stoves which had excess smoke and, in some cases, leaky oil lines which permitted the oil to flow on the floor making it quite slippery.

In all of the messes observed at the time of the survey there seemed to be an abundance of cooking utensils. These included pots, pans, spoons, etc. In many messes the troops were away, either in the north along the Thai border or in the Congo. This probably is why there seemed to be an excess of available utensils.[1/] For survey purposes this was fortuitous in that a number of pans could be weighed and marked prior to the start of the survey. Generally, too, there was an adequate number of preparation tables, wash basins and sinks in the kitchen. In the permanent-type mess there were steam tables which were used only for serving. The messes usually had sufficient space for washing pots and pans although there was a lack of hot water and soap in most instances. The messes usually had a vegetable preparation room and some messes had potato peelers which were automatic. More commonly needed were automatic coconut grinders which were observed in some messes. Battalion A had a homemade coconut scraper which served the purpose very well. All messes had sufficient storage space for their utensils. Each mess also had a scale which was used daily for weighing the rations which were delivered to the mess by the contractor.

1/ The usual barrack schedule does not normally allow for a surplus of cooking utensils.

The messes all had storage rooms, and the meat preparation room was usually screened. With the exception of Battalion B, the refrigerators were in good working order. Only those foods which needed to be refrigerated were found in the refrigerators. Storage of bread, vegetables and condiments was generally excellent in all messes observed.

Soap and scouring powder were said to be issued "on demand." It did not appear that the demand for these items was excessive. Also, as indicated above, very few of the messes observed had hot water for washing pots and pans or the dishes and cups of the troops. Battalion C seemed to wash its mess gear with the greatest care. In some messes the water supply was limited or curtailed, making it extremely hard for the mess personnel and troops to get their mess gear clean. Battalion D had a 180-gallon water trailer which served as auxiliary water tank. At other units where the water supply is curtailed such a water trailer could be used to good advantage. Battalion D also had 55-gallon drums which were halved, set in a concrete base and heated by a wood fire beneath, although they were not in use at the time of the survey. Two or three of these halved drums would provide good sanitary cleaning of mess gear. It would seem that a supply of hot water is one of the primary prerequisites of the mess.

Permanent-type messes had grease traps. How often they were cleaned is not known.

As the morning meal is prepared in the dark and the evening meal is served in the dark, the lights in the mess, as well as the messing area, are important. Various types of lighting fixtures were observed, from single electric bulbs to fluorescent fixtures.

As most of the cooking area was open, flies were a problem in some of the messes. Fly paper was used by some of the messes. The meat preparation rooms were screened and consequently free of flies.

In most of the messes toilets were available for the mess personnel. Rules for sanitation were found on the bulletin boards in the cooking areas. These rules included the following necessary items: that a medical certificate should be posted, that medical inspections should be made, that clothes worn in the mess should be laundered and white, that wash basins should be provided for mess personnel, that no other clothes should be kept in the mess, that smoking was forbidden, that soap and cleaner should be issued, that all equipment used should be cleaned, vegetables prepared in the vegetable room, no vegetables or any food should be left in the pots overnight, no food should be uncovered, no food should be left over in the rubbish bin, and that the kitchen and the dining hall should be clean. In some messes a statement was posted that the menu should be approved by the commanding officer and that the duty officer should be present at the meals. That the latter was the case was noted on several occasions during the survey. The duty roster, the leave roster, the Menu, Ration Scale, special details, the Medical Inspectors Report and the Daily Feeding Strength were usually also posted on the bulletin board.

Due to the excessive amount of rain at certain times of the year, drainage was a problem in some of the messes observed. It would be useful to store this rain water in cisterns which thus would be available to those troops where the water supply is now curtailed.

In some messes, sleeping quarters adjacent to the mess were available for mess personnel. At other locations the mess personnel lived at a considerable distance from the mess hall. Although in some of the battalions movies were shown in the mess halls at night, they seemed to be clean for breakfast the following morning.

It is to be noted that the troops were issued ice water for their noon meal beverage. This ice was delivered by the fresh food contractor and was said to be prepared from potable water.

Food Preparation

Very few of the food items, with the exception of fruits, were consumed in the raw state. One of the messes surveyed served a raw cucumber-onion salad approximately once a week.

In general, food preparation was as follows: The vegetables and meats were usually prepared in the fresh state in the morning in sufficient quantity for the whole day. The noon meal was cooked and ready to serve at about 1300 hours. Ordinarily a minimum of time elapsed between food preparation and serving of the noon meal. However, the food for the evening meal was prepared far in advance and generally the kitchen was cleaned up before the troops started to eat. This was understandable, as the evening meal generally was rather late following tea, and the mess personnel were anxious to complete their day's work.

Breakfast in all of the messes was similar. As indicated above, it consisted of bread made from enriched flour with the crust trimmed off, steamed and served warm on the mess line, a boiled egg, jam, fortified margarine and tea with sugar and milk. The jam and margarine were hardly touched, as the troops only brought their cup for tea with them for breakfast. In one of the messes a wooden spatula was provided for serving the margarine and jam. Here the margarine was allowed to stand out overnight to soften instead of being refrigerated, and the consumption of these two items in this mess was more than twice the average of the ordinary mess. Considerable amounts of evaporated milk and sugar were consumed in the tea, which was very sweet and milky.

Each of the other two meals consisted of three dishes, rice, a meat or fish curry and a vegetable curry, with water as the usual beverage. In the afternoon (at 1600 hours) tea was served with fresh fruit or cake or, in one case, green grams which had been purchased through moneys received from the swill fund (see below, Edible Waste, p. 88). While attendance at other meals was very close to the expected strength, attendance at tea was more limited. In smaller messes extra rations were issued, as the use of the ration was not so efficient as it was in larger messes. In one mess which had a strength of about 50 men, 56 rations were issued, which constituted about a 10 percent increase over the authorized ration strength.

Rice was the common item served at both the noon and the evening meals. The ration allowance for rice is 16 ounces per man per day. It usually constituted the major food item at either meal. Rice preparation varied from mess to mess, sometimes due to the equipment available and at other times due

to the training of the mess personnel. In some messes the exact amount of water needed was added to the rice and there was thus no nutrient loss from drainage. In other messes the rice was boiled in excess water which was later drained off, and the cooking was completed with the use of steam. In still other messes the water was drained or sieved off with consequent loss of nutrients. One pound of dry rice produced from 1.5 to 2.7 pounds of cooked rice, the average being 2.4 pounds. All the rice used by the Army units was a good grade Kedah rice which came from the Federation Supplies and Transport Services supply company. There was some contamination with rice moths, but it was hoped that fumigation would be able to take care of this in the near future. Rice was thoroughly washed before cooking. Because of the very adequate rice ration it was usually served from the kitchen even though the other items prepared in the kitchen were sometimes served by company personnel. "Seconds" of rice were available at the noon and evening meals.

The meat or fish curry was prepared by sautéing in coconut oil and adding numerous condiments and some vegetables. The fish were sometimes deep-fat fried and served with a hot curry sauce.

Coconut milk was used in the preparation of the vegetable curries which were cooked for some time. It was made by soaking and extracting shredded coconut with water followed by screening out the large particles. This extraction was repeated a second time with about the same amount of water and the extracted shredded coconut was then discarded. This process took considerable time unless there was a motorized coconut scraper available. The composition of the "coconut milk" depended primarily on the water dilution factor. Generally the shredded coconut was extracted with approximately twice its weight of water. The water naturally present in the coconut was generally not used.

From figures obtained in the mess it was found that the shell and husk of the coconut constituted about 40 percent of its total weight. The remainder of the weight was about equally divided between the coconut meat and the natural coconut water. Consequently the coconut milk prepared for use in the mess varied from about 50 to 75 percent of the weight of the original coconuts. In some cases more than twice the weight of the original coconuts was observed so the amount prepared undoubtedly depended somewhat on the volume of liquid which was needed in cooking. These factors should be considered when observing results of analysis of prepared coconut milk.

As indicated previously, fresh milk was served to only two messes surveyed, the students at the Federation Military College and the recruits. Occasionally fresh milk was a ration supplement for the battery handlers. The contribution from dairy products in the ration came from condensed milk which was used primarily in tea. Tea seemed to be prepared in a different manner in each of the messes. It was always an acceptable product with approximately the same amounts of milk and sugar per cup. The excess margarine from the ration was used in the preparation of baked goods.

Fresh fruits were served daily. The major ones encountered in the survey were bananas, pineapple and rambutan. These are potentially very good sources of vitamin C. Very generous portions were served during tea and, as there were no cooking losses involved, the ascorbic acid intake should be at its maximum.

Each of the messes obtained money from its swill fund (see below, Edible Waste, p. 88) to purchase special food items to supplement the ration. The amount varied from about $20 at a small mess to $125-$150 per month at a larger mess, depending upon the number of men. Some of the items purchased were green grams at Battalion E, kaya (egg jam) at Battalion C and fish at Battalion A. The items purchased were usually of excellent nutritional quality.

To be emphasized is the difficulty which some of the messes had in preparation of foods for troops of different religious customs. In spite of this an RECCE had one of the best messes visited and the troops seemed particularly pleased with their food.

Food Production

At none of the military units studied was any food production or gardening of any sort noted.

Food Outside Mess

The ration store was visited at each of the survey sites. There was a great similarity among them, depending upon the space available for storage of food items. If separate rooms were available, like items of the ration were stored therein. For instance, there would be a dry store room in which one would find rice, flour, sugar and certain canned items. Condiments were usually stored in labeled tinned boxes. Dunnage was used and the storage items were maintained in a neat and orderly manner. A running inventory was usually kept so that the stock could be determined at any time. All of the ration stores had a three-day emergency ration supply. This was rotated when the expiration date of the particular items became effective. Not all of the ration stores were rodent-proof, but no obvious signs of rodents were noted.

In some units the "fresh" contractor delivered his supplies to the ration store where they were broken down and delivered to the mess. At other units the fresh food contractor delivered his foods directly to the mess. The ration store issued certain items of the dry rations to the mess daily and others weekly. At all of the ration stores there was a bulletin board listing the number of troops, the number of rations, unit strength, hospital leave, the issue for tomorrow, etc.

There was also a canteen at most of the Army units where the troops could purchase soft drinks and certain food items at odd hours during the day. These were visited in order to ascertain what food items might be purchased and their possible significance to the nutrition of the soldier. The items sold included doughnuts, fried bananas, curry puffs, sweet potatoes, tapioca, mead, some sweets, and soft drinks. The best managed canteens were inspected weekly in addition to a medical inspector's report for the food handlers. Possibly up to twenty cents a day was spent by the soldier in the canteen, most on soft drinks, bread and/or fried noodles. The hours that the canteen was open varied depending upon units but was usually a short time in mid-morning, afternoon and early evening. Of some significance was the fact that the baked goods sold in the canteen were generally made from Australian flour which had not been enriched.

In some locations a Navy, Army and Air Force Institute (NAAFI) was available for married soldiers' families to purchase foods. The need for a commissary seemed to depend upon the location of the unit with reference to a nearby town or market. The commissaries viewed were generally not very large and contained a limited number of food items. Usually there were small amounts either of fish and/or meat available, vegetables, such as long beans, eggplant, gourds, cabbage, etc., certain canned goods such as soups and milk as well as sweets and bread. These could be classified as general staple food items.

Most military units seemed to be situated near a town of sufficient size to provide a market from which fresh foods could be procured. However, there were certain units which were located near very small towns which did not have such markets. In these cases the fresh foods were transported from Headquarters, Federation Supplies and Transport Services, daily - a distance of some 80 miles or more. When the fresh foods were procured locally, the market from which they came was observed. This provided an estimate as to the kinds and quantities of fresh vegetables and fish which were available, as well as fruits in season at the time of the survey. It also provided an estimate as to the care with which fresh meat and fish particularly were handled prior to delivery to the mess.

Sanitation

In general the sanitation in the military messes was probably superior to that of most of the other countries in the Far East, but flies, insects and pets did constitute a problem. However, certain areas of the mess were screened, particularly where fresh meat or fish was prepared and in most areas where swill was stored. This did much to alleviate the fly problem. Mess inspections seemed to be made daily both by officers and noncommissioned officers. Curtailed water supplies and the lack of hot water probably were the two major contributing factors to lack of sanitation. Generally the fresh foods were delivered to the mess in a sanitary manner but on one occasion it was noted that both the fresh meat and vegetables were covered with baskets during their delivery to the mess. This procedure should be encouraged.

Edible Waste

The edible waste was usually contracted at a given price per month to civilians located near the Army units, who collected it for feeding to livestock. The swill was made up primarily of rice, some fish bones and other types of vegetables. It was estimated that 20-30 percent of the rice eventually ended up in the swill. The money obtained in this manner was used mainly to purchase certain items not available in the ration which would tend to supplement the Army ration and make it more acceptable to the troops.

The Use of Condiments

The Malayan Army used a large variety of different hot spices and condiments in their daily ration. Included in this group were such usual items as vinegar, soybean ketchup, fresh and dried prawns, garlic, fresh ginger, coriander seed and tamarind. In addition to these condiments others used were anise, fenugreek, cinnamon sticks, turmeric, cloves, cardamon, mustard, poppy

seeds and, of course, salt and pepper. These spices are all used daily in the preparation of the meat and vegetable curries. It is doubtful that any is used to such a significant extent that it would contribute any nutritional supplement to the ration. Their contribution is mainly to make the prepared foods more appetizing to the troops.

Overpreparation of Foods

A summary of the average percent of overprepared foods found in all of the units surveyed may be noted in Table 34. The items of most nutritional significance are rice and bread. In no instance during the survey did any of the units serve all of the rice which they had prepared. In addition, in some of the units, due to the methods of preparation, from 3 to 6 percent of the rice was burned and not served (see above, under Edible Waste). This would indicate that the rice ration for the Malayan troops is ample to generous.

TABLE 34. AVERAGE PERCENT OF FOODS OVERPREPARED, ALL BATTALIONS, MILITARY, MALAYA

Item	Percent
Rice	15-20
Meat curry	5-15
Fish curry	5-15
Bread (trim only)	20-30
Mixed vegetable curry	10-25

The ration allows four ounces of bread per man per day. One ounce of this is trimmed in the crust and is never served to the troops. Bread crusts were customarily trimmed wherever it was served. One is not sure whether the bread crusts are trimmed to make the bread more acceptable and palatable to the troops or whether it is trimmed for sanitary purposes.

Generally very little of the meat or fish curry was overprepared as these items were rather carefully and specifically divided so that each soldier should receive his share. With the number of rations known it was rather easy to divide these acceptable items and leave very little overprepared food. However, with some vegetable curries overprepared food was noted. Lady fingers and cabbage sometimes were prepared in excess up to 40-50 percent. In other instances these same items were overprepared only to a limited extent of 10 percent. It is interesting to note that at one of the messes where liver was prepared and served, no overpreparation was recorded, and all was served to the troops. In another instance a cucumber-onion fresh salad was served in its entirety.

Plate scrapings, on the other hand, are indicative of what the soldier chooses not to eat. By and large, it would seem that the Malayan soldier eats what he takes. This may be observed in the summary of the average percent "plate scrapings" of all units found in Table 35. From 8 to 15 percent of the bread served at breakfast ended up as plate scrapings. While this amount is not excessive, it has to be considered when the bread has already been trimmed, and thus the total amount becomes of nutritional significance. Rice, the major constituent of the ration, is also the major constituent of plate

scrapings, averaging 7 to 15 percent. This lends further evidence that the rice ration of the Malayan soldier is generous. The remainder of the items from the plate scrapings are negligible and constitute such things as fish bones which are nonedible.

TABLE 35. AVERAGE PERCENT OF PLATE SCRAPINGS, ALL BATTALIONS, MILITARY, MALAYA

Item	Percent
Rice	7-15
Meat curry	0-3
Fish curry	4-6
Bread	8-15
Mixed vegetable curry	3-5

Field Operations

Field operation rations in the Malayan Army are discussed above under Malayan Troops Ration Scale. The ration as prepared has proved itself to be quite adequate both by chemical analysis and calculations from tables of food composition. It has had daily practical use in the jungles of northern Malaya.

Federation Military College Messes

A visit was made to the messes of the Federation Military College. This is a rather new institution in Malaya, and the physical facilities making up the mess are the finest in the country. The cooking areas in the messes were divided according to race. The Indians and Chinese cooked together on one side and the Malays on the other. There was a raised platform in the center of the kitchen for the cook sergeant to observe. The equipment included excellent steam kettles, rice cookers, electric hot plates, etc. The storage rooms were painted white. The floors were tiled. There were screened areas and storerooms for vegetables, meat and even cutlery. There are two categories of students at this college, boy soldiers (up to 17 1/2 years of age) who are there for a three-year training program, and officer cadets who receive two years further training. Each boy soldier receives one-half pint of milk per day. It was said that when the boy comes to start his training he does not particularly care for milk but by the end of the first year consumption is 100 percent. The messing area was a delightful place with colored curtains and tables, well lighted and ventilated. At the time of the study there were 295 boys in this training program.

The officers' training mess which had similar fine messing conditions was also visited. These men furnish money to supplement the Army ration with foods which they desire. Each cadet contributes one dollar per week from his own pocket for the purchase of items not issued or of insufficient quantity in the ration. The items mentioned were tomatoes, ice cream, etc. In this special case there were some civilians in the 120-man mess. They had facilities for dish washing and drying. The milk which was served was "sterilized" milk and was said to have a shelf life of two years and cost 45 cents per pint.

The messes at the Federation Military College were the outstanding messes observed in Malaya for physical facilities and equipment. There was no opportunity to run a survey at these messes, but after noting the facilities, equipment and mess personnel, one can be sure that the nutrition of the cadets and the officer training candidates will be better than that observed at any of the other units of the Army. The messing facilities at the Federation Military College exemplify what should be the goal of the remainder of the messing units of the Royal Malayan Army.

Food Consumption and Nutrient Intake

A comparison of results of the recipe method, the food composite analysis method and the basic ration reveals that most of the daily nutrients are within the "acceptable" levels as suggested by the ICNND (Table 30; Appendix Tables 28-30, 32, 34, 35). This is particularly true for the basic ration, which provides over 3,900 Calories and is in the "acceptable" level for all the nutrients. Thiamine and riboflavin are in the "deficient" or "low" range according to the recipe method. By the food composite analysis method the nutrients below the "acceptable" level are thiamine, riboflavin and vitamin C. This is particularly significant when one realizes that this method represents the actual nutrient intake as consumed by the soldier. It would appear that the basic Army ration contains 25 percent more Calories than required which in turn provides nutrients to bring the "low" into the "acceptable" range in the case of the B-vitamins and vitamin C. It would also indicate that these nutrients could be lost in the preparation or serving of the ration.

Calories

The caloric value of the ration by both the recipe and food composite analysis methods is in excellent agreement. The caloric consumption would indicate that the troops were engaged in rather vigorous physical activities, which was true. The caloric intakes for all Army units surveyed were "acceptable."

As expected, the greatest contributor of Calories is rice. However, it is to be noted that meat and fish, oils, and sugar also make significant contributions to the caloric intake. This is shown in the table presenting percentage of nutrients from the various foods by the recipe method (Table 36).

Protein

The protein level of the ration is "acceptable" regardless of the method by which it is determined. As 40 percent of the protein comes from animal sources, it is undoubtedly of high quality, providing the necessary essential amino acids (see also Appendix Table 33).

Fat

The fats in the Army ration come primarily from oils such as coconut, ghi and margarine, secondly from meats and fish, and, interestingly, a considerable percentage of the fat Calories come from fresh coconut. As has been noted in other surveys, the fat found in the food composite analysis

TABLE 36. PERCENTAGE CONTRIBUTION OF NUTRIENTS FROM VARIOUS FOODS BY RECIPE METHOD, MILITARY, MALAYA[1/]
(Average of All Units (6))

Major Food Item or Group	Calories	Protein	Carbo-hydrate	Fat	Calcium	Iron	Vitamin A	Thia-mine	Ribo-flavin	Niacin	Vitamin C
Bread	5.4	5.6	7.5	0.5	1.6	8.6	--	7.9	8.9	10.8	--
Flour, white	1.7	1.5	2.4	--	0.5	0.1	--	1.2	1.0	1.8	--
Rice	39.4	25.7	57.0	3.2	6.3	33.5	--	8.9	6.0	17.0	--
Sugar	9.4	--	16.3	--	--	--	--	--	--	--	--
Coconut	5.9	1.9	1.4	17.6	1.9	4.5	--	5.5	0.9	1.0	--
Vegetables	3.1	4.6	4.4	--	27.4	10.0	38.2	18.1	12.4	10.0	48.5
Fruits	2.7	1.0	4.6	--	3.5	3.5	8.7	8.9	3.5	3.6	41.4
Milk, evaporated	3.6	6.5	1.6	6.4	38.9	1.0	4.5	5.2	22.4	1.8	1.4
Meat and fish	12.4	40.0	--	27.4	6.8	17.6	30.8	18.0	29.5	50.1	--
Oils	12.8	--	--	45.0	--	--	--	--	--	--	--

1/ See Appendix Table 32.

method is less than that calculated by the recipe method or found in the basic ration. This is probably due to fat losses during food preparation and in the cooking and serving of the foods, and is not surprising since the Malayan Army ration specifies "lean beef" along with fresh fish, neither of which is noted for its fat content. Less than 20 percent of the Calories in the food composite analysis method actually come from fat.

Vitamin B-Complex

Thiamine. The thiamine intake as determined by the recipe method was below the "acceptable" levels of the ICNND suggested guide. As might be expected, the thiamine in the ration came mainly from meat and fish, vegetables, rice and fruits. The recipe method calculations are in good agreement with the results found by food composite analysis. Both methods indicate that considerable amounts of thiamine are lost during food preparation, cooking and serving. These results would show that thiamine is one of the critical nutrients in the ration "as served."

Riboflavin. The riboflavin content of the ration as determined by the recipe method or the food composite analysis method was nearly in the "acceptable" level range. Of particular interest is the extent to which evaporated milk contributed towards this intake level by supplying more than 20 percent of the riboflavin in this ration. Meat and fish were the other large contributors, followed by vegetables. It is of nutritional interest that the riboflavin content of the ration could so nearly approach the "acceptable" level while the thiamine content was at the same time in the "low" range.

Niacin. The niacin content of the ration whether calculated by the recipe method, food composite analysis method or in the basic ration, is within the "acceptable" levels of the ICNND. This is not surprising when one considers the amount of meat and fish available which contribute approximately 50 percent of the niacin in the ration. The major sources for the remainder of this vitamin are rice, vegetables and bread. More niacin was found by chemical analysis than by calculation using the recipe method.

Vitamin A

A significant difference is noted between the vitamin A content of the ration as determined by the recipe method and by the food composite analysis method. It is evident that the values which are used for fresh vegetables in the recipe method may overemphasize the actual carotene content which is found after food preparation and serving. The recipe method would indicate that levels of this vitamin in the ration were in the "acceptable" to "high range. However, it is important to note that the food as consumed by the troops in 3 of the 6 units contained less than 1,000 IU of vitamin A per man per day. This chemical fact is difficult to reconcile with the varied and considerable consumption of leafy, green and yellow vegetables and even, in one instance, beef liver. It is also to be noted that some vitamin A was contributed by milk, by fortification of the margarine which was consumed, and to some extent even by fruits such as papaya which were also consumed in a fresh state. While the consumption of this vitamin may not have been within the "acceptable" level, it is doubtful that over a period of time it would be below the 1,000

IU per man per day indicated by the chemical analysis. The low value for this vitamin possibly may be attributed to methods of preservation which were used in compositing the sample.

Vitamin C

The vitamin C content of the ration as calculated by the recipe method was considerably higher than that which was actually found by the food composite analysis. The values found by recipe calculations were well above the "acceptable" range. It is believed that this more nearly represents the actual intake of this vitamin than the chemical analysis data for the food composite. The reason for arriving at this conclusion is that an average of 26 mg of vitamin C were contributed daily to the ration by fresh fruits, such as pineapple, rambutans, papaya and even bananas which were eaten in considerable quantities. As might be expected, over 40 percent of the ration content of this vitamin was contributed by fruits and almost 50 percent by vegetables. However, the vitamin contribution of the latter could be considerably less than that calculated due to losses during preparation which may be even greater than anticipated. One would consider that the vitamin C nutriture of the Malayan soldier would be in the "acceptable" level regardless of the results of the food composite analysis.

Minerals

Iron. The iron content of this diet, regardless of the method by which it is calculated, is in the "acceptable" range. Iron as determined by food composite analysis is greater than the amount obtained by the recipe method, which undoubtedly reflects additional iron contributed by cooking utensils or water. The iron intake from this ration is undoubtedly adequate.

Calcium. The calcium level of this ration is not particularly high. However, it still is within the "acceptable" level by any method used in calculating this element. Calcium, along with riboflavin, is the main contribution of the evaporated milk in the Malayan Army ration. The other major source of calcium is the variety of leafy, green and yellow vegetables consumed by these soldiers. It is to be noted that the calcium content as calculated by the recipe method is practically identical to that found by the food composite analysis method. It would appear that the calcium content of this ration is "acceptable."

Salt (Sodium Chloride). The intake of salt ranged from 9.1 to 14.6 gm per man per day, averaging 10.7 gm as determined by chemical analysis. This is in good agreement with the calculated average value of 11.0 gm.

Minor Nutrients

Iodine. An analysis of this ration for iodine content was not made, in view of the fact that a considerable portion of the ration was obtained from products of the ocean which should be fairly rich in this element. It may well be that this analysis should have been made in view of the goitrogenic effect of certain plant materials. It is to be noted that iodized salt was not used in the messes and that salt was imported.

Fluorine. It would appear that the fluorine intake in the messes where surveys were made was within the "acceptable" range. No fluorosis was observed, indicating that there was no excess intake of this element. On the other hand, foods which normally contain a considerable amount of fluorine such as tea and fish were consumed in rather substantial amounts. It is not known whether there were sufficient quantities of fluorine in the diet to influence the prevention of dental caries (see Table 27 for fluorine in water and urine samples).

Vitamin B_6. The intakes of this vitamin were 1.08, 1.38, 1.18, 1.04, 1.18 and 1.42 mg per man per day. The average intake was 1.21 mg per man per day. According to the best recent scientific judgment with respect to the intake of this vitamin these levels would appear to be somewhat on the low side.

Vitamin B_{12}. A considerable variation in the intake of this vitamin was noted, from less than 1.0 µg in one unit to over 9 µg per man per day in another unit. These results are lower than those from some other surveys but the significance of this vitamin in human nutritive requirements is not known at the present time. It is possible that the results as reported could be somewhat low.

Folic Acid. The folic acid intake in the various units surveyed ranged from 0.70 to 0.98 mg per man per day. This is said to be in the range which will maintain good folic acid nutrition.

Pantothenic Acid. About 10 mg of pantothenic acid are usually consumed daily per 2,500 Calories, according to observations in the literature. However, the values obtained from the food composite samples in this survey averaged less than 1 mg per man per day. This is undoubtedly due to chemical discrepancies in preserving the food composite or in the analytical procedures. It is to be noted that similar results were found in the Burma survey (3). A study of the stability of this vitamin in food composites should be made. There is no reason to believe that this regimen did not supply an adequate amount of this omnipresent vitamin in the ration.

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VII

MILITARY DEPENDENTS

Clinical

Because the number of military dependents (over 5 years of age) examined was only 505 compared with approximately ten times that number of civilians of similar age, these two groups of data were combined for the clinical evaluations. The dental and dietary sections have maintaired separate reports for them. Accordingly, clinical reports on this population group will be found under Chapter VIII.

Chemical

Only 44 samples were obtained from military dependents for biochemical evaluation, and of these 86.2 percent were nonpregnant, nonlactating females. Because of the small sample size it was not possible to draw conclusions from the data. Consequently the military dependent and the civilian data have been combined (see Chapter VIII).

Dental

The oral health of male and female military dependents is shown in Tables 37 and 38. Only 102 male military dependents were examined, 100 of whom were from 0 to 9 years of age and only 2 being 10 to 14 years old. No caries were encountered in the 0 to 4 year age group. The mean numbers of diseased, missing and filled (DMF) teeth in the 5 to 9 age group was 0.20. Some indications of periodontal disease were found in those between 0 to 9 years but there was no attrition or recession. Considerable debris was found in all age groups of male dependents but little calculus was present. Due to the large amount of debris, the Oral Hygiene Index (OHI) was at a relatively high level. Due to the small numbers of individuals examined, comparisons were not made with regard to area of origin or to religion.

The oral health of the female dependents of military personnel is shown in Table 38, over three hundred having been examined. A comparison is made in Table 39 of DMF, PI (Periodontal Index) and OHI in male and female military dependents in Malaya and Burma. The mean numbers of DMF teeth in this group reached a fairly high level early in life and continued to rise with increasing age, although there was some variation between progressive age groups. The mean DMF rates of female military dependents did not vary greatly from the DMF rates of other females examined in Malaya. Likewise, PI, attrition, recession, debris, calculus and OHI follow similar patterns with regard to the general female population of Malaya. When the female dependents are compared with regard to race (Table 40), it can be seen that the DMF score for the Chinese (Buddhists; 8.2) was nearly twice as large as that for Malayans (Moslems; 5.49) or other groups (3.42). Likewise the Chinese had a higher PI and attrition score than the other racial groups, but the recession, debris, calculus and OHI were greater for the Malayans than for the other racial groups.

TABLE 37. THE ORAL HEALTH STATUS OF MALE MILITARY DEPENDENTS BY AGE, FEDERATION OF MALAYA, 1962

Age (years)	DMF[1/]		PI[2/]		Attrition		Recession		Debris		Calculus		OHI[3/]	
	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean
0-4	71	0.000	71	0.013	0	0.000	70	0.0	71	1.213	71	0.014	71	1.227
5-9	29	C.20	29	0.014	9	0.000	29	0.0	29	1.293	29	0.017	29	1.310
10-14	2	+.00	2	0.000	2	0.000	2	0.0	2	0.100	2	1.000	2	2.000
Total and Mean	102	0.14	102	0.013	11	0.000	102	0.0	102	1.231	102	0.016	102	1.248

1/ Diseased, missing, filled.
2/ Periodontal Index.
3/ Oral Hygiene Index.

TABLE 38. THE ORAL HEALTH STATUS OF FEMALE MILITARY DEPENDENTS BY AGE, FEDERATION OF MALAYA, 1962

Age (years)	DMF[1/]		PI[2/]		Attrition		Recession		Debris		Calculus		OHI[3/]	
	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean
0-4	42	0.00	42	0.000	1	0.000	42	0.0	41	1.246	41	0.000	41	1.246
5-9	37	0.32	37	0.013	18	0.000	37	0.0	36	1.186	36	0.033	36	1.219
10-14	3	3.33	3	0.000	2	0.000	3	0.0	3	0.900	3	0.100	3	1.000
15-19	36	6.63	36	0.305	36	0.744	35	2.1	36	0.894	36	0.522	36	1.416
20-24	131	6.70	131	0.300	130	0.898	131	2.6	131	0.923	131	0.590	131	1.514
25-29	52	8.01	52	0.911	50	0.918	51	9.3	51	1.066	51	0.815	51	1.882
30-34	20	10.05	20	1.015	19	1.200	20	13.3	20	0.830	20	0.715	20	1.545
35-39	4	7.50	4	0.825	4	1.225	4	25.2	4	1.175	4	1.225	4	2.400
40-44	1	16.00	1	3.500	1	1.000	1	25.0	1	1.000	1	1.300	1	2.300
Total and Mean	326	5.53	326	0.384	261	0.836	324	3.9	323	1.011	323	0.494	323	1.505

1/ Diseased, missing, filled.
2/ Periodontal Index.
3/ Oral Hygiene Index.

TABLE 39. A COMPARISON OF CERTAIN DENTAL HEALTH INDICES IN MILITARY DEPENDENTS IN MALAYA AND BURMA 1/

Age (years)	DMF 2/ Malaya Male	DMF 2/ Malaya Female	DMF 2/ Burma (1) Male	DMF 2/ Burma (1) Female	PI 3/ Malaya Male	PI 3/ Malaya Female	PI 3/ Burma (1) Male	PI 3/ Burma (1) Female	OHI 4/ Malaya Male	OHI 4/ Malaya Female	OHI 4/ Burma (1) Male	OHI 4/ Burma (1) Female
0-4	0.0	0.0	0.0	0.0	0.01	0.00	0.28	0.24	1.22	1.24	0.00	0.00
5-9	0.2	0.3	0.1	0.1	0.01	0.01	0.41	0.32	1.31	1.22	2.30	1.82
10-14	4.0	3.3	0.4	0.6	0.00	0.00	0.62	0.43	2.00	1.00	1.76	1.74
15-19		6.6	0.9	1.1		0.30	0.94	0.56		1.42	1.46	1.46
20-24		6.7		1.2		0.30		0.91		1.51		1.96
25-29		8.0				0.91				1.88		
30-34		10.0		1.8		1.01		1.56		1.54		2.37
35-39		7.5				0.82				2.40		
40-44		16.0		3.4		3.5		2.45		2.30		2.75
45-49												
50+				13.0				6.54				3.33

1/ Numbers in parentheses refer to references.
2/ Diseased, missing, filled.
3/ Periodontal Index.
4/ Oral Hygiene Index.

TABLE 40. THE ORAL HEALTH STATUS OF FEMALE MILITARY DEPENDENTS ACCORDING TO RACE, FEDERATION OF MALAYA, 1962

Oral Condition	Race: Malayan No.	Malayan Mean score	Chinese No.	Chinese Mean score	Other No.	Other Mean score
DMF 1/	300	5.49	14	8.2	12	3.42
PI 2/	300	0.392	14	0.528	12	0.033
Attrition	240	0.833	10	0.920	11	0.836
Recession	298	4.1	14	2.3	12	1.2
Debris	297	1.024	14	0.978	12	0.700
Calculus	297	0.510	14	0.264	12	0.375
OHI 3/	297	1.535	14	1.243	12	1.075

1/ Diseased, missing, filled.
2/ Periodontal Index.
3/ Oral Hygiene Index.

Dietary

Population Studied

Food intake data were obtained by the questionnaire method. Dietary surveys of the military dependent population were carried out in the camps of eight military units in eight states, as shown in Table 41.

Housing of Military Dependents

Married soldiers are usually provided with housing at the military installation. They receive a living allowance in addition to their military salary. In some cases, military families were living away from the camp.

Food Supply and Preparation

Most of the food consumed by the family is purchased at the local market. In units not close to a village, small marketing facilities are set up within or close to the camp site. Fresh fish and meat must be bought daily.

Cooking for the family is done in the home on an open fire or a kerosene stove, often once a day, in the morning, with the exception of rice, which is cooked fresh for each of the two main meals. The meal consists of rice, and usually some type of curry known as "gulai," made from fresh fish. "Gulai lemak," a vegetable prepared in a similar manner (see Appendix 36), is usually taken at one meal. Fish, especially dry salted fish, and vegetables are also prepared by frying in coconut oil.

Rice is washed three times in cold water before cooking. For cooking, the rice is covered with cold water "to a depth of two fingers," covered and cooked for approximately twenty minutes or until the water has evaporated and the rice is fluffy. Rice cooked in this manner increases in weight 2 to 3 times the weight of dry raw rice.

TABLE 41. COMPOSITION OF MILITARY DEPENDENT DIETARY SAMPLE INTERVIEWED BY QUESTIONNAIRE METHOD, MALAYA

Location	Kelantan	Pahang	Johore	Malacca	Negri Sembilan	Perak	Kedah	Selangor	Total
No. families	14	4	11	12	6	18	9	13	87
No. individuals	54	19	48	45	33	70	39	59	367
Ave. no. per household	3.8	4.2	4.8	3.7	5.5	3.9	4.3	4.5	4.3
Age (years)									
<1	4	4	2	9	3	5	2	3	32
1-3	8	3	9	7	5	13	4	6	55
4-6	6	4	10	4	7	8	8	14	61
7-9	4	-	1	1	3	3	5	7	24
10-12	1	-	4	-	1	2	2	2	12
	M[1] F[1]	M F	M F	M F	M F	M F	M F	M F	M F
13-15	F: 3				M: 2	1 1		M: 1	4 4
16-19	F: 2	F: 1				F: 3	F: 3		F: 9
20-59	14 6	M: 4	11 8	12 7	6 3	18 10	9 4	13 9	87 47
60+						F: 1			F: 1
No. lactating women	6	3	3	5	3	5	1	3	29
No. pregnant women							1	1	2

1/ M = males; F = females.

TABLE 42. NUTRIENT INTAKE OF MILITARY DEPENDENTS PER STANDARD MAN PER DAY, MALAYA
(Questionnaire Method)

Location	Calories	Protein gm	Fat gm	Carbo-hydrate gm	Calcium gm	Iron mg	Vitamin A IU	Thia-mine mg	Ribo-flavin mg	Niacin mg	Vitamin C mg
Kelantan	2,772	51	92	435	0.16	6.3	430	0.56	0.4	14.0	20.0
Pahang	2,198	48	70	344	0.15	5.3	850	0.5	0.30	6.0	18.0
Johore	2,242	64	74	330	0.4	6.6	2,700	0.66	0.58	10.0	17.0
Malacca	2,503	50	69	421	0.17	10.0	2,510	0.8	0.44	7.5	59.0
Negri Sembilan	2,296	37	72	375	0.20	10.0	2,700	0.8	0.5	9.4	60.0
Perak	2,390	70	79	350	0.3	6.7	1,000	0.7	0.41	8.2	37.0
Kedah	2,212	43	68	357	0.23	6.9	1,500	0.5	0.4	8.0	59.0
Selangor	2,000	60	60	305	0.3	7.0	2,280	1.[illegible]	0.6	9.0	60.0

Curries of small amounts of fish, meat, or vegetables are cooked in "santan" to which are added condiments, usually garlic, onions, kunyit, fresh or dry chillies and belachan made into a paste or "rempah." The small ikan bilis, or tau foo, may be added to vegetable dishes also, but only in small amounts. A soup or tumis is sometimes prepared from vegetables. Pulses are used for the most part by the Indian population and to a lesser extent by the other two population groups. An important part of the Malay meal is "sambal belachan" served separately as a condiment or accompaniment to fish or vegetables (see Appendix 36). There is little consumption of meat by Malays anywhere in the country, with the exception of the men in the military (see Chapter VI).

The breakfast meal for military dependent families consists of a loaf of store white bread or roti chenai, a pancake-like food (see Appendix 36), and coffee or tea with sugar and condensed milk. Among some military families, fortified margarine is consumed in small amounts at the breakfast meal.

Cooking is done in aluminum and iron pots. An important utensil in all Malay houses is the kuali or round-bottomed iron skillet that sits on the open fire and is used for frying foods. Rice is cooked in either a covered iron or aluminum pot.

Food Consumption and Nutrient Intake

Table 42 presents the distribution of nutrient intakes based on a standard man for this group as determined by the questionnaire method. The "standard man" equivalent for various age and sex groups is found in Appendix Table 7.

Calories

Caloric intake of military dependents appears to be adequate when compared with the standard Recommended National Allowance for the Malayan population stated by Lady Thomson (2; see Appendix Table 37). However, this figure for caloric intake is based on a "standard man" per day intake, and food distribution within the family may not provide adequate Calories in terms of the amounts needed by certain members of the family. The greater percent of the Calories comes from rice and sugar (see Table 43), and as a result the nutrients lacking in these food items, vitamins A and C and calcium, are inadequately provided by the diet. A breakdown of the major food groups which supply the nutrients of the Malayan diet is given in Appendix Table 68, section on civilians.

TABLE 43. PERCENT OF CALORIES FROM PROTEIN, FAT AND CARBOHYDRATE IN THE MALAYAN DIET

	Military Dependents 1/	Civilians 1/	Civilians 2/
Protein	9	10	12
Fat	27	22	24
Carbohydrate	64	62	64

1/ Questionnaire method.

2/ Food composite analysis method.

Protein

The protein intakes when compared with the ICNND reference guide (see Appendix Table 30) fall in the "acceptable" range, although in two locations intakes of 60 gm were recorded. The main sources of protein in the diet are rice and fish. A few other protein foods such as bean curd or tau foo, eggs and flour also make contributions. Vegetables, especially legumes, contribute to the protein intake. Milk, usually consumed in the sweetened condensed form, is not used in significant amounts. However, in some military dependent families some of the younger children are receiving powdered milk which could contribute to the protein intake of these children.

Fat

Fat supplies approximately 20-25 percent of the total Calories per day (Table 43). The diet sources of this fat are coconut oil and coconut milk used in cooking both the curry and "goreng." Some fat in the diet of these military dependents comes from fortified margarine that is available in military installations where military families purchase.

Vitamins

Thiamine. Thiamine intake as determined by the questionnaire method appears "low" in most locations.

Riboflavin. Riboflavin intake is also low according to the Recommended National Allowance for Malaya and the ICNND suggested guide for nutrient intake.

Niacin. Niacin intakes are low according to the Recommended National Allowance for Malaya, but "acceptable" by the ICNND reference guide.

Vitamin A

Vitamin A intakes are below the Recommended National Allowance and fall in the category of "low" or "deficient" with reference to the ICNND suggested guide.

Vitamin C

Vitamin C intake varies widely in the locations studied. The intake of vitamin C ranges from the "low" to "acceptable" ICNND suggested reference guide (Appendix Table 30). Fruit, exclusive of the banana, is not consumed regularly in any area and the fact that some areas are able to produce fruit better than others may explain the variation.

Minerals

Iron. Iron intake levels appear to be adequate or nearly so by the ICNND suggested reference guide. Clinical evidence suggests that this is the case, especially in the children. The contributing sources of iron to the diet include fish and green vegetables.

Calcium. The dietary intake of calcium is low in all but one location (except in those children getting powdered milk) compared to both sets of reference standards used (Appendix Tables 30 and 37), although clinical evidence failed to show a lack of calcium. Calcium is supplied in the diet of the military dependents by dried fish (the bones being consumed in most cases) and dark green vegetables. Addition of larger amounts of sources of calcium, such as milk, would be desirable.

References

1. Interdepartmental Committee on Nutrition for National Defense. Union of Burma, Nutrition Survey, Washington, May 1963

2. Thomson, F.A., Institute for Medical Research, Report No. 64, Kuala Lumpur, 1960

3. Recommended Dietary Allowances, Revised 1958, National Academy of Sciences - National Research Council Publication 589, Washington

VIII

CIVILIAN GROUPS

Clinical (including both civilians and military dependents)

The numbers studied exclusive of pediatric examinations are: civilians 5,408 and dependents 505 for abbreviated examinations, and 1,300 (both groups combined) for detailed examinations. Of this group a total of 153 women were pregnant and 195 women were lactating. Four hundred eighty-eight boys and 455 girls less than 5 years of age (a total of 939) were examined.

The heights and weights of boys and girls age 0 to 5 years and of boys and girls age 5 to 17 years are plotted on the accompanying graphs (Figures 12-17) along with similar plots for the countries of Thailand and Burma, with the exception of those less than one year of age. (The numbers of children under 12 months of age who were weighed and measured in Burma and Thailand were too few to make comparison valid in this age group.) These plots are made on the standard Iowa growth curve graphs. It is noted that the Malayan children were somewhat larger in both height and weight than their counterparts in these other two southeast Asian countries (see also Appendix Table 38). This confirms previous studies in Malaya (1-7).

This group of examinations indicates that approximately 79 percent of the subjects were from rural communities (Table 44). About 40 percent were Chinese, 53 percent Malayan, and 6 percent Indian. By religion 52 percent were Moslem and 39 percent Buddhist. The age distribution of the sample examined was fairly good, giving 29 percent in the 5-9 year group, 31 percent in the 10-14 year group and 28 percent in the 15-44 year group. Only about 12 percent were over age 45. By sex the distribution was not equal, 30 percent of the 5-9 year group being males, 35 percent of the 10-14 year-group males, and 23 percent of the 15-44 year group males. Only 11.6 percent of those over 45 were men (Table 44).

Clinical evidences of malnutrition were not found frequently. A few Bitot's spots were found in children under age 5 and there were some abnormalities of the lips and of the interdental papillae in children ages 3-4 (Table 45). The most common lesion seen was swollen red papillae, but even this occurred less than 3 percent of the time. In the children age 5-14 swollen red papillae were much more frequently found and goiter became more common (see Tables 46, 47 and 48). In men and women over age 15 there was more nasolabial seborrhea, some angular scars, about the same prevalence of swollen red papillae as that seen in the children but now more than 9 percent of the subjects had goiter and 8.8 percent had loss of ankle jerks bilaterally (Table 47). It is of interest that nasolabial seborrhea was a bit more common in pregnant and lactating women and goiter was almost twice as common in these people as in the remainder of the group studied (see also Appendix Tables 39-42).

Blood pressure as depicted in the accompanying graph and table (Figure 18 and Table 49) showed an interesting difference between men and women. The pressure began at low levels in children of both sexes and rose rather

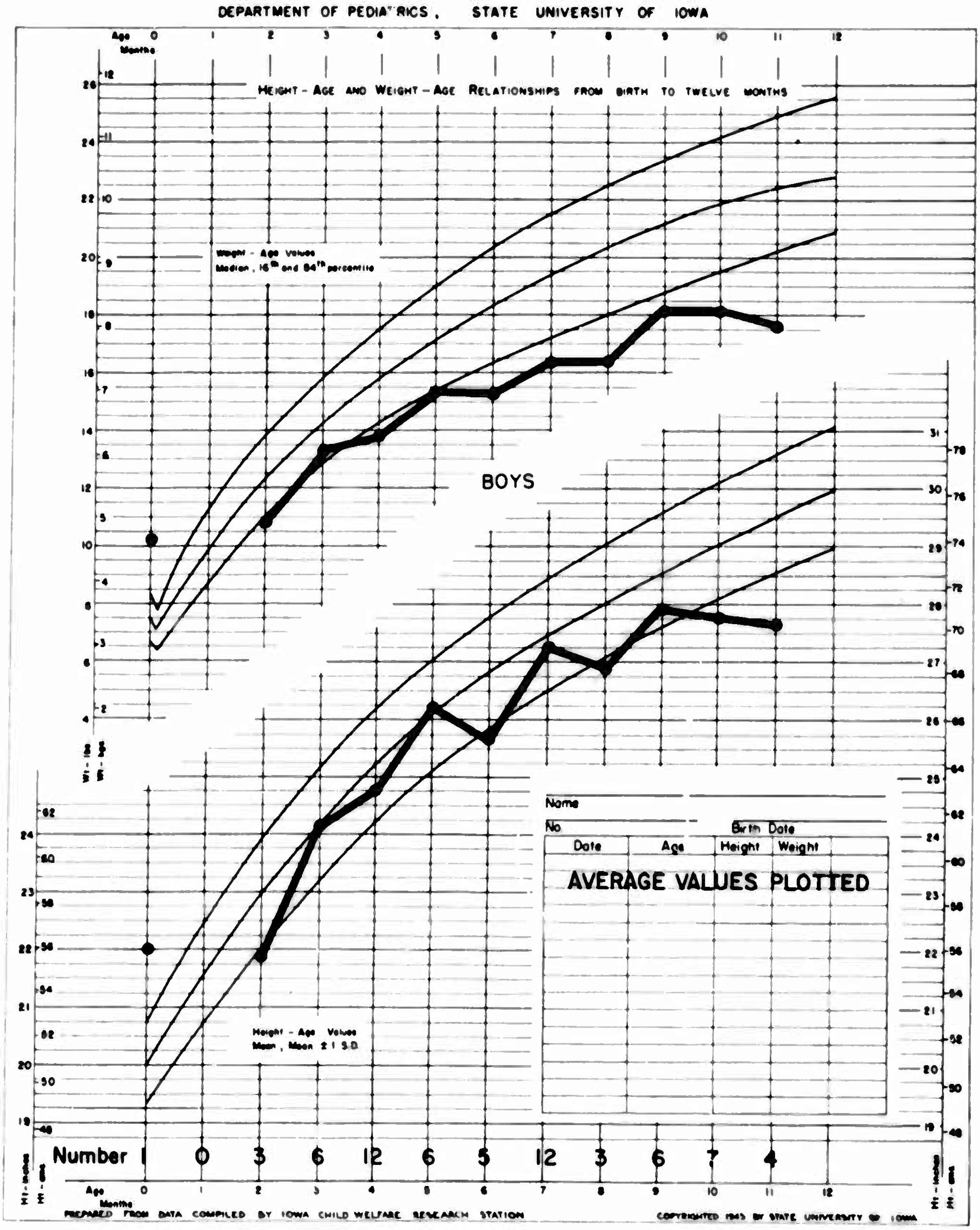

FIGURE 12. HEIGHTS AND WEIGHTS OF MALAYAN BOYS LESS THAN ONE YEAR OLD

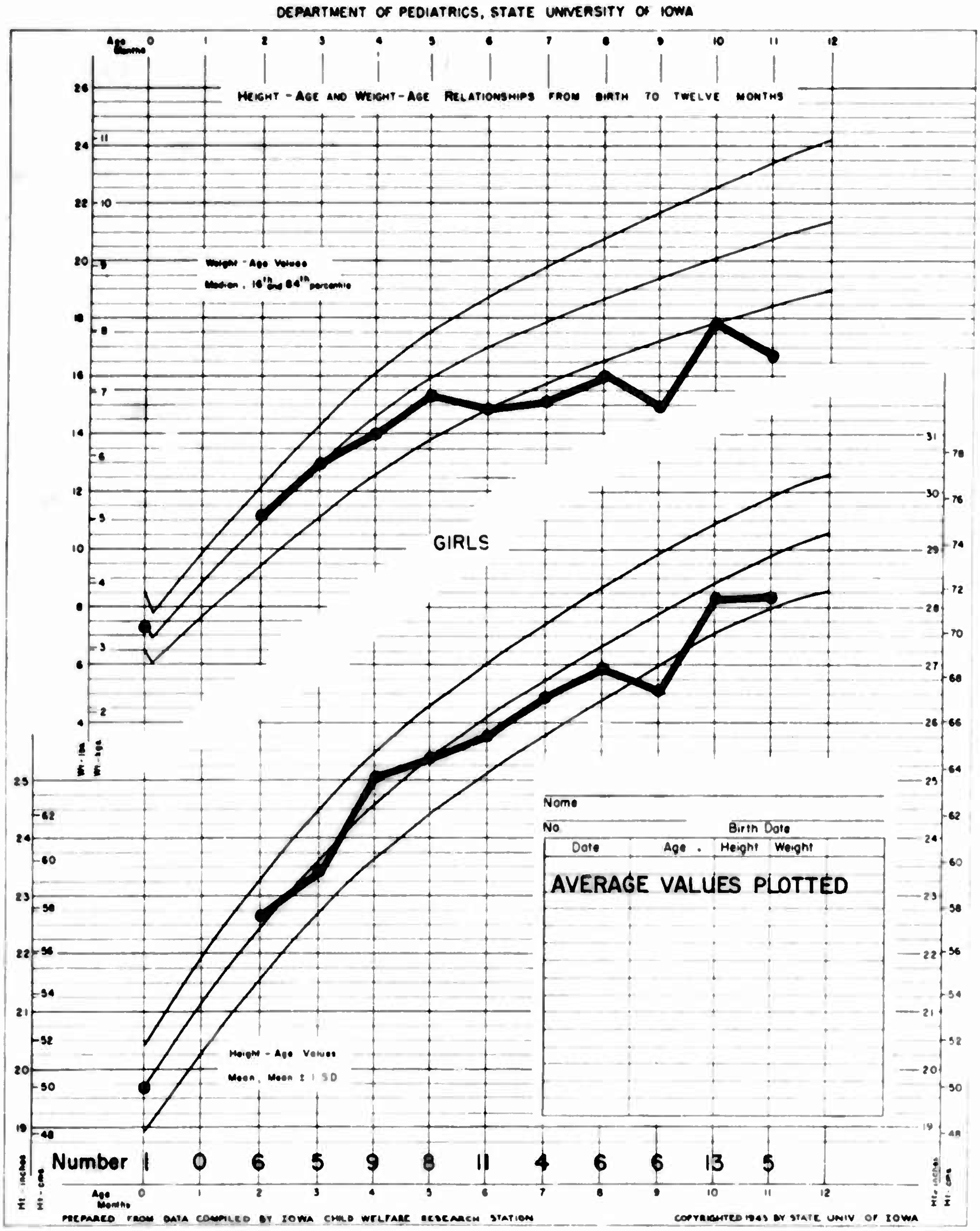

FIGURE 13. HEIGHTS AND WEIGHTS OF MALAYAN GIRLS LESS THAN ONE YEAR OLD

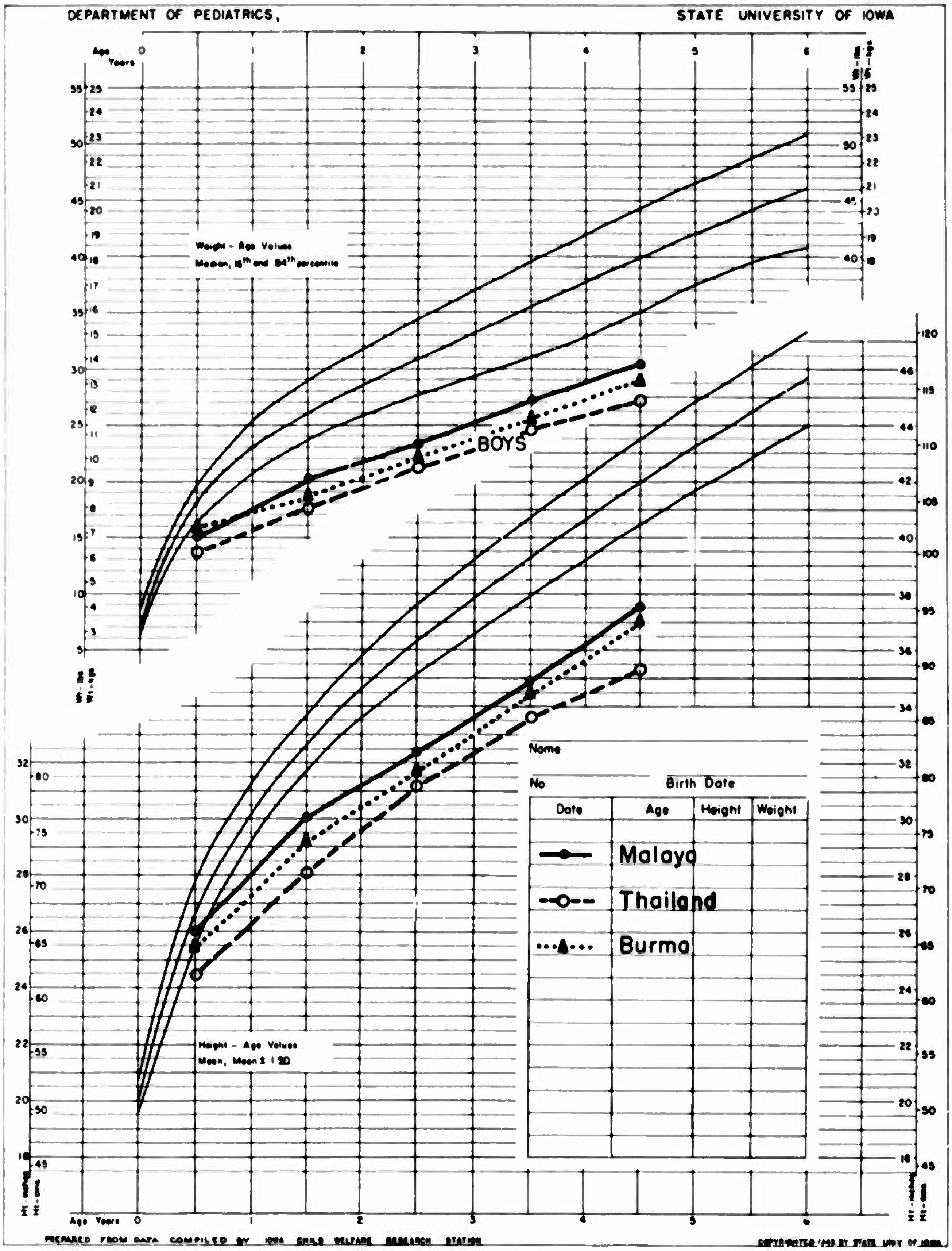

FIGURE 14. HEIGHTS AND WEIGHTS OF MALAYAN BOYS 0 TO 5 YEARS OF AGE, COMPARED WITH THAI AND BURMESE BOYS OF SAME AGE

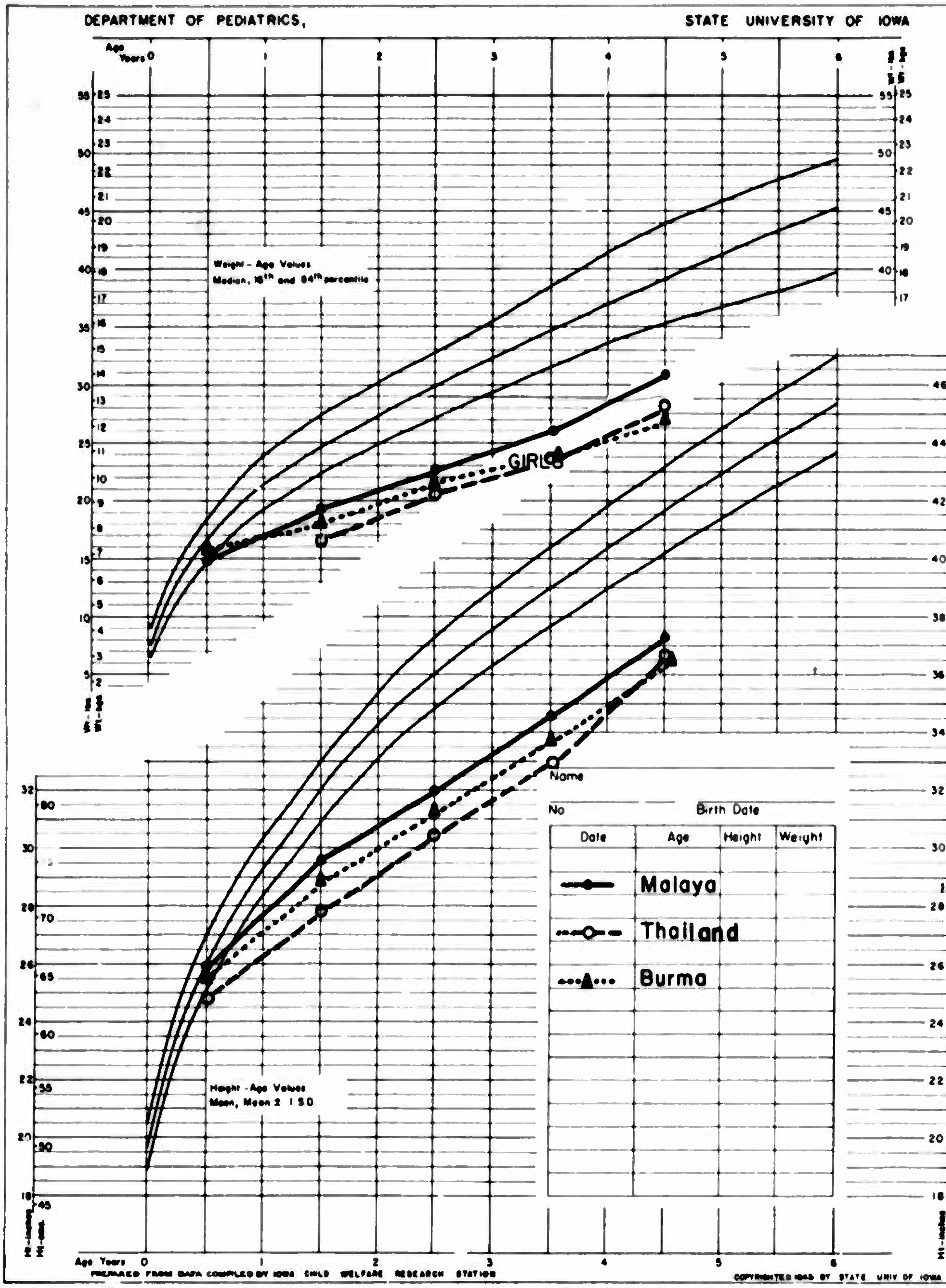

FIGURE 15. HEIGHTS AND WEIGHTS OF MALAYAN GIRLS 0 TO 5 YEARS OF AGE, COMPARED WITH THAI AND BURMESE GIRLS OF SAME AGE

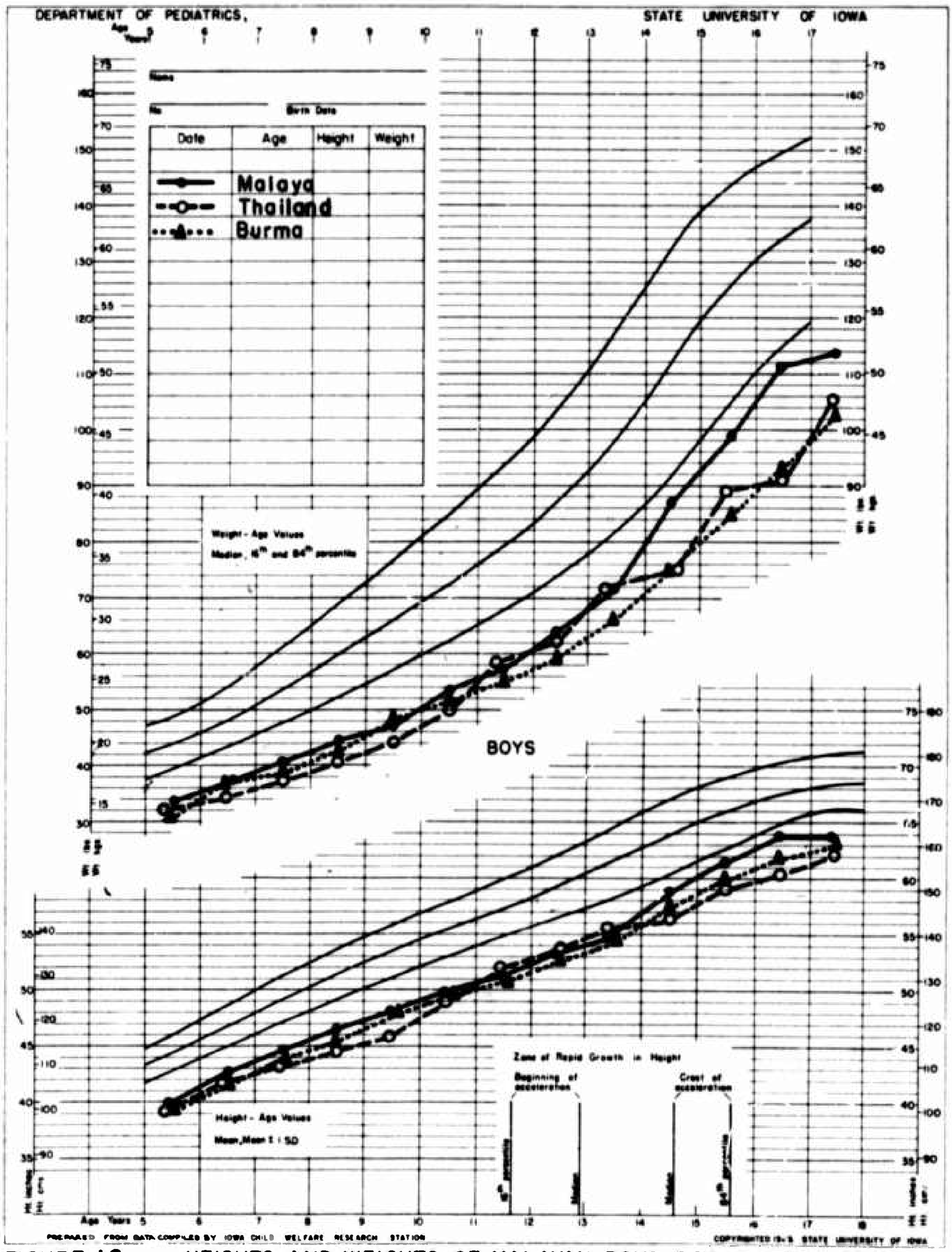

FIGURE 16. HEIGHTS AND WEIGHTS OF MALAYAN BOYS 5 TO 17 YEARS OF AGE COMPARED WITH THAI AND BURMESE BOYS OF SAME AGE

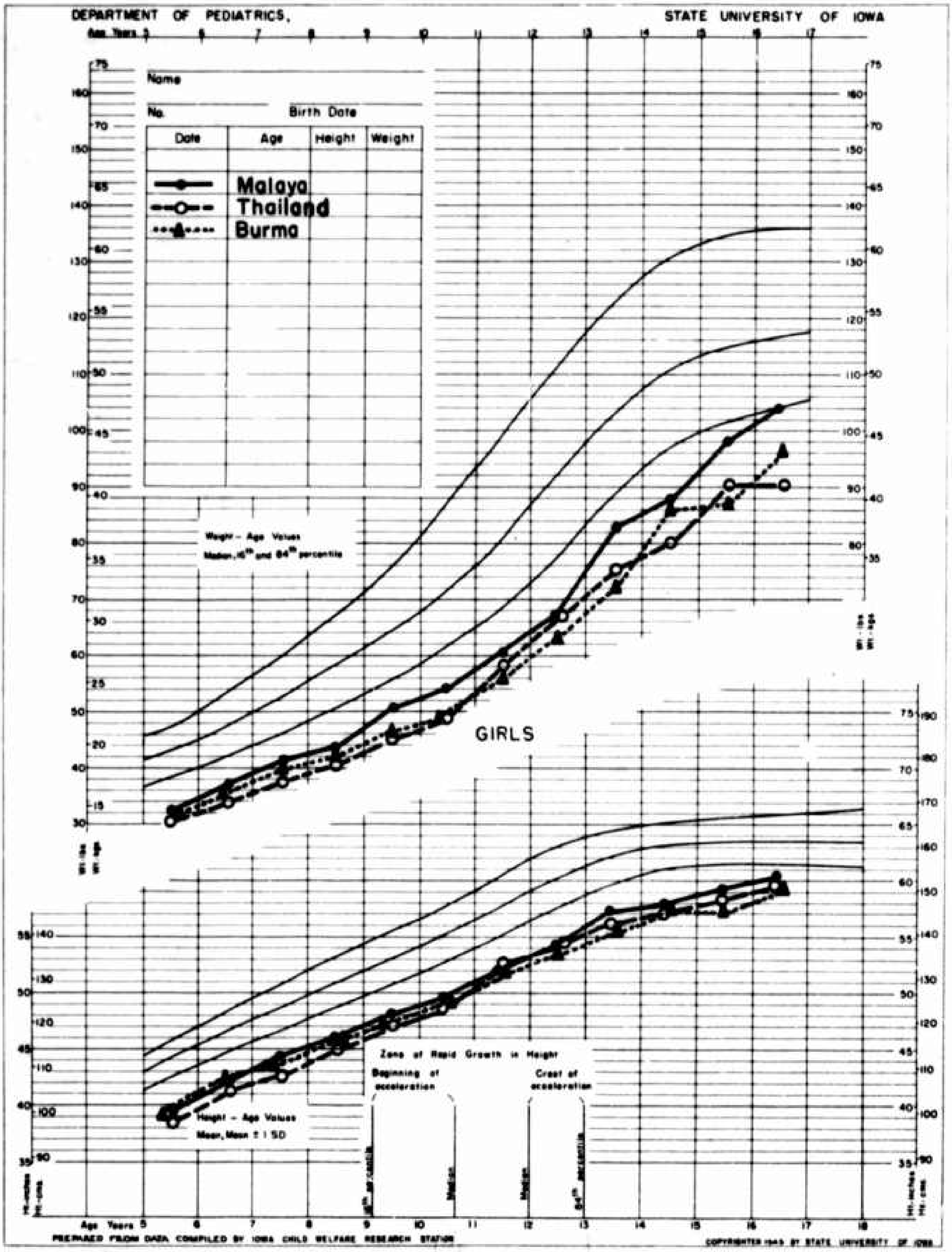

FIGURE 17. HEIGHTS AND WEIGHTS OF MALAYAN GIRLS 5 TO 16 YEARS OF AGE COMPARED WITH THAI AND BURMESE BOYS OF THE SAME AGE

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TABLE 44. PERCENT DISTRIBUTION OF CIVILIAN AND MILITARY DEPENDENT SAMPLE BY LOCATION, AREA OF ORIGIN, RURAL VS. URBAN ORIGIN, RACE AND AGE, MALAYA

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
Number 1/	1,028	887	636	559	1,414	668	52	669	5,913
				Percent Distribution					
Area of Origin									
Selangor	1.6	0.8	0.5	63.3	0.3	0.7	--	1.2	6.7
Kelantan	2.3	2.4	85.2	0.7	0.4	2.1	--	0.3	10.4
Pahang	0.9	0.6	0.6	0.5	--	77.5	--	0.3	9.1
Johore	65.2	1.8	0.3	0.9	0.5	1.0	--	1.5	12.1
Malacca	5.8	5.3	5.8	4.3	2.0	7.5	100.0	86.4	14.8
Perak	3.4	5.3	4.1	3.2	84.0	6.4	--	6.7	23.7
Kedah	1.1	80.9	1.6	1.1	0.8	0.4	--	1.2	13.0
Trengganu	--	0.3	0.6	0.2	--	1.0	--	--	0.2
Penang	0.5	2.2	0.5	1.6	0.4	0.4	--	0.6	0.8
Others	19.2	0.3	0.8	6.1	11.7	2.7	--	1.8	7.3
Rural	64.8	83.4	73.4	32.4	100.0	74.2	100.0	99.4	79.2
Urban	35.2	16.6	26.6	67.6	--	25.7	--	0.6	20.8
Race									
Chinese	52.0	8.8	22.0	15.7	91.2	26.5	--	7.8	39.9
Malay	33.8	89.7	76.4	52.8	6.2	73.5	100.0	88.9	53.3
Indian	14.1	1.2	--	30.2	2.3	--	--	3.3	6.4
Other	--	0.2	--	0.2	--	--	--	--	0.05
				Civilians					
Males									
Number	485	370	255	260	729	267	40	337	2,743
Age (years)				Percent Distribution					
5-9	19.8	2.4	25.9	34.6	42.0	47.2	5.0	37.4	29.9
10-14	28.9	38.9	23.1	40.8	39.8	36.0	25.0	38.0	35.5
15-44	30.9	51.1	23.9	16.5	10.3	12.4	62.5	16.6	23.0
45+	20.4	7.6	27.0	8.1	8.0	4.5	7.5	8.0	11.6

1/ Population over 5 years of age; population distribution under 5 years given on following page.

TABLE 44 (Continued) PERCENT DISTRIBUTION OF CIVILIAN AND MILITARY DEPENDENT SAMPLE BY LOCATION, AREA OF ORIGIN, RURAL VS. URBAN ORIGIN, RACE AND AGE, MALAYA

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
				Civilians (Continued)					
Females, nonpregnant, nonlactating									
Number	404	365	369	236	570	321	11	217	2,493
Age (years)				Percent Distribution					
5-9	18.8	7.9	19.0	41.5	43.7	43.3	--	41.0	30.1
10-14	31.9	45.5	19.8	30.9	21.8	20.9	18.2	25.3	27.6
15-44	29.2	41.4	44.7	23.3	16.0	30.5	81.8	12.4	28.6
45+	20.0	5.2	16.5	4.2	18.6	5.3	--	21.2	13.6
				Number					
Pregnant	14	1	7	2	20	18	--	1	63
Lactating	4	6	5	20	9	62	1	2	109
				Children, Under 5, Civilians and Military Dependents					
Males									
Number	59	61	57	50	103	102	6	50	488
Age (years)				Percent Distribution					
<1	8.5	19.7	5.3	18.0	10.7	15.7		18.0	13.3
1	15.2	21.3	28.1	20.0	24.3	24.5	16.7	24.0	22.7
2	18.6	21.3	33.3	16.0	28.2	16.7		12.0	21.1
3	25.4	19.7	19.3	28.0	24.3	22.5	33.3	30.0	24.0
4	32.2	18.0	14.0	18.0	12.6	20.6	50.0	16.0	18.8
Females									
Number	62	71	65	37	90	88	2	40	455
Age (years)				Percent Distribution					
<1	1.6	18.3	21.5	24.3	16.7	20.4		15.0	16.7
1	14.5	19.7	20.0	13.5	24.4	20.4	50.0	20.0	19.8
2	30.6	12.7	24.6	16.2	23.3	19.3		22.5	21.3
3	24.2	23.9	21.5	24.3	22.2	26.1	50.0	20.0	23.5
4	29.0	25.4	12.3	21.6	13.3	13.6		22.5	18.7

TABLE 44 (Continued) PERCENT DISTRIBUTION OF CIVILIAN AND MILITARY DEPENDENT SAMPLE BY LOCATION, AREA OF ORIGIN, RURAL VS. URBAN ORIGIN, RACE AND AGE, MALAYA

Location	Johore	Kedah	Selangor	Perak	Malacca	Total
			Military Dependents			
Males						
Number	14	13	3	10	14	54
Age (years)			Percent Distribution			
5-9	92.8	92.3	100.0	100.0	85.7	92.6
10-14	7.1	7.7	--	--	14.3	7.4
Females, nonpregnant, nonlactating						
Number	68	67	37	41	62	275
Age (years)			Percent Distribution			
5-9	33.8	19.4	13.5	24.4	21.0	23.3
10-14	--	--	--	--	1.6	0.4
15-19	1.5	20.9	8.1	12.2	12.9	11.3
20-24	42.6	31.3	45.9	36.6	48.4	40.7
25-29	16.2	14.9	21.6	19.5	14.5	16.7
30-34	5.9	10.4	10.8	4.9	1.6	6.5
35+	--	3.0	--	2.4	--	1.1
			Number			
Pregnant	20	31	1	14	24	90
Lactating	19	34	--	21	12	86

TABLE 45. CLINICAL FINDINGS BY SEX AND AGE, CHILDREN UNDER 5 YEARS OF AGE, ABBREVIATED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

	Males						Females					
Age (years)	<1	1	2	3	4	Total	<1	1	2	3	4	Total
Number	64	111	103	116	92	486	76	90	97	106	84	453
						Percent Distribution						
Eyes												
Bitot's spots					1.1	0.2						--
Skin, Face and Neck												
Nasolabial seborrhea		0.9		0.9		0.4	1.3					0.2
Lips												
Angular lesions				2.6	2.2	1.0		1.1		0.9	2.4	0.9
Angular scars				0.9	2.2	0.6	1.3				2.4	0.7
Cheilosis					1.1	0.2						--
Gums												
Swollen red papillae												
Localized		4.5	3.9	5.2	3.3	3.7	1.3	3.3	1.0	8.5	10.7	5.1
Diffuse		1.8		4.3	2.2	1.8	1.3	1.1	3.1	3.8	3.6	2.6
Tongue												
Filiform papillary atrophy												
Slight	1.6		1.0		5.4	1.4		1.1	2.1	2.8	2.4	1.8
Moderate/severe		1.8		0.9	2.2	1.0		1.1	1.0	2.8		1.1
Glossitis						--				0.9		0.2
Glands												
Thyroid enlarged				0.9	1.1	0.4		1.1	1.0	1.9	4.8	1.8
Skin, General												
Follicular hyperkeratosis												
Anywhere		1.8	1.9			0.8	1.3	1.1		0.9		0.7
Arms		1.8	1.9			0.8	1.3	1.1		0.9		0.7
Back		1.8	1.9			0.8	1.3	1.1		0.9		0.7
Thighs		1.8	1.0			0.6		1.1				0.2
Lower Extremities												
Loss of ankle jerk												
Unilateral		1.8			2.2	0.8	2.6	1.1		0.9		0.9
Bilateral	1.6	1.8	1.9	2.6	2.2	2.0		2.2	1.0	1.9	1.2	1.3
Calf tenderness				0.9		0.2						--

TABLE 46. CLINICAL FINDINGS BY SEX AND AGE, ABBREVIATED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

	Males				
Age (years)	5-9	10-14	15-44	45+	Total
Number	871	977	632	317	2,797
	Percent Prevalence				
Eyes					
Bitot's spots	0.1	0.6			0.3
Skin, Face and Neck					
Nasolabial seborrhea	0.3	0.2	7.4	12.9	3.3
Lips					
Angular lesions	2.3	2.3	1.7	2.8	2.2
Angular scars	5.5	6.8	3.5	8.5	5.8
Cheilosis	0.1	0.2	0.2		0.1
Gums					
Swollen red papillae					
Localized	7.7	10.2	10.1	6.9	9.0
Diffuse	9.1	19.0	16.0	15.1	14.8
Tongue					
Filiform papillary atrophy					
Slight	2.3	1.4	0.6	1.9	1.6
Moderate/severe	0.7	0.6	0.2	1.6	0.6
Glossitis	0.2	0.1	0.5	0.9	0.3
Magenta colored	0.1	0.4	1.4	3.2	0.9
Glands					
Thyroid enlarged					
Grade I	1.4	2.1	1.6	0.9	1.6
Grades II and III				0.3	0.04
Skin, General					
Follicular hyperkeratosis					
Anywhere	0.8	0.4	0.6	1.6	0.7
Arms	0.6	0.2	0.5	1.6	0.5
Back	0.5	0.3	0.5	0.9	0.5
Thighs	0.2	0.2	0.3	0.3	0.3
Lower Extremities					
Bilateral edema	0.2			1.9	0.3
Loss of ankle jerk					
Unilateral	1.3	0.9	1.6	3.8	1.5
Bilateral	1.8	2.0	3.8	24.9	5.0
Calf tenderness	0.5	0.4	0.2	1.3	0.5

TABLE 46 (Continued) CLINICAL FINDINGS BY SEX AND AGE, ABBREVIATED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Nonpregnant, Nonlactating Females					Preg-	Lacta-
5-9	10-14	15-44	45+	Total	nant	ting
814	690	924	340	2,768	153	195
		Percent Prevalence				
0.4	0.3	0.2		0.3		
0.4	1.3	9.0	4.7	4.0	10.5	9.7
2.1	0.6	1.2	3.2	1.6	2.0	1.5
3.6	4.6	4.7	10.3	5.0	2.0	4.6
0.1				0.04		
6.3	8.7	8.8	9.4	8.1	11.8	11.3
7.9	14.3	12.9	12.0	11.7	9.8	14.9
1.6	0.3	2.1	4.1	1.7	5.2	2.6
0.9	0.1	0.5	4.7	1.0	2.6	0.5
0.1		0.1	0.3	0.1		
0.2	0.4	0.3	2.9	0.7		0.5
3.4	9.1	17.6	10.3	10.4	22.9	13.8
	0.1	0.4	0.6	0.3	0.7	
1.1	0.6	0.9		0.8		1.0
1.1	0.4	0.8		0.7		
0.4	0.4	0.2		0.3		
0.4	0.1	0.4		0.3		1.0
0.2		0.5	2.4	0.5	4.6	
1.1	1.4	0.9	3.2	1.4		0.5
3.8	2.0	3.1	19.1	5.0	0.7	3.6
0.5	0.4	0.4	1.5	0.6		1.0

TABLE 47. CLINICAL FINDINGS BY AGE, AREA OF ORIGIN AND RACE, CIVILIANS AND MILITARY DEPENDENTS, ABBREVIATED EXAMINATIONS, MALAYA

	Sex and Age (years)		
	Males and Females 5-14	Males and Females[1/] 15+	Females[2/] 15+
Total examined	3,351	2,214	348
Clinical findings	Percent Prevalence		
Eyes			
Bitot's spots	0.4	0.1	--
Skin, Face and Neck			
Nasolabial seborrhea	0.5	8.4	10.0
Lips			
Angular lesions	1.9	1.9	1.7
Angular scars	5.2	5.7	3.4
Cheilosis	0.1	0.04	--
Gums			
Swollen red papillae - Localized	8.3	9.0	11.5
Diffuse	12.8	14.0	12.6
Tongue			
Filiform papillary atrophy	2.1	3.1	5.1
Glossitis	0.1	0.4	--
Glands			
Thyroid enlarged	3.7	9.8	18.1
Skin, General			
Follicular hyperkeratosis - Anywhere	0.7	0.8	0.6
Lower Extremities			
Loss of ankle jerk - Bilateral	2.4	8.8	2.3
Calf tenderness	0.4	0.6	0.6

Males and Females <5 Years

	Race			
	Malay	Chinese	Indian	Total
Number	729	165	45	939
Clinical findings	Percent Prevalence			
Eyes				
Bitot's spots	--	0.6	--	0.1
Skin, Face and Neck				
Nasolabial seborrhea	0.4	--	--	0.3
Lips				
Angular lesions	0.7	0.6	6.7	1.0
Angular scars	0.4	1.8	--	0.6
Cheilosis	0.1	--	--	0.1
Gums				
Swollen red papillae - Localized	4.0	6.7	2.2	4.4
Diffuse	1.5	5.4	2.2	2.2

1/ Nonpregnant, nonlactating.
2/ Pregnant and lactating.

TABLE 47 (Continued) CLINICAL FINDINGS BY AGE, AREA OF ORIGIN AND RACE, CIVILIANS AND MILITARY DEPENDENTS, ABBREVIATED EXAMINATIONS, MALAYA

Area of Origin			Race			
Rural	Urban	Total	Malay	Chinese	Indian	Other
4,681	1,232	5,913	3,100	2,338	368	107
		Percent Prevalence				
0.3	--	0.2	0.4	--	0.3	--
4.1	4.0	4.0	5.3	2.3	3.8	5.6
2.2	0.6	1.9	1.2	2.9	1.6	0.9
6.5	0.9	5.3	3.3	8.8	1.6	0.9
0.1	--	0.1	0.1	0.04	--	--
9.9	4.3	8.7	9.8	8.4	4.1	1.9
15.6	4.1	13.2	15.5	11.6	7.1	0.9
3.1	1.1	2.7	2.9	2.2	3.8	1.9
0.2	0.1	0.2	0.2	0.2	0.3	--
7.2	5.7	6.9	7.6	5.4	11.4	1.9
0.6	1.2	0.7	0.6	0.6	2.4	0.9
5.1	3.7	4.8	5.5	3.4	7.9	2.8
0.5	0.6	0.5	0.5	0.6	0.5	0.9

Males and Females <5 Years (continued)

	Race			
	Malay	Chinese	Indian	Total
Number	729	165	45	939
Clinical findings (continued)	Percent Prevalence			
Tongue				
Filiform papillary atrophy				
Slight	1.1	2.4	6.7	1.6
Moderate/severe	1.0	1.2	2.2	1.1
Glossitis	0.1	--	--	0.1
Glands				
Thyroid enlarged	1.0	0.6	4.4	1.1
Skin, General				
Follicular hyperkeratosis - Anywhere	1.0	--	--	0.7
Lower Extremities				
Loss of ankle jerk - Bilateral	1.6	2.4	--	1.7
Calf tenderness	0.1	--	--	0.1

TABLE 48. CLINICAL FINDINGS BY AGE AND LOCATION, AB .VIATED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, 'ALAYA

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
	Males and Females Under 5 Years								
Number	121	132	122	84	193	189	8	90	939
	Percent Distribution								
Eyes									
Bitot's spots	0.8								0.1
Skin, Face and Neck									
Nasolabial seborrhea	0.8			1.2		0.5			0.3
Lips									
Angular lesions		0.8	0.8	3.6	1.6			1.1	1.0
Angular scars		1.5			1.6			1.1	0.6
Cheilosis		0.8							0.1
Gums									
Swollen red papillae									
Localized	5.8	11.4	2.4		7.2	1.0			4.4
Diffuse	2.5	3.8	1.6		5.2			1.1	2.2
Tongue									
Filiform papillary atrophy									
Slight	5.0	0.8	0.8	2.4	1.0			3.3	1.6
Moderate/severe	2.5				2.1	1.0		1.1	1.1
Glossitis					0.5				0.1
Glands									
Thyroid enlarged	1.6		0.8	1.2		2.6		1.1	1.1
Skin, General									
Follicular hyperkeratosis									
Anywhere	0.8		4.1		0.5				0.7
Arms	0.8		4.1		0.5				0.7
Back	0.8		4.1		0.5				0.7
Thighs	0.8		1.6		0.5				0.4
Lower Extremities									
Loss of ankle jerk									
Unilateral				2.4	0.5	1.0	12.5	2.2	0.8
Bilateral	2.5		1.6	1.2	2.1	2.1		2.2	1.7
Calf tenderness					0.5				0.1

TABLE 48 (Continued) CLINICAL FINDINGS BY AGE AND LOCATION, ABBREVIATED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
	Males and Females 5-14 Years								
Number	441	348	268	367	969	428	14	398	3,233
	Percent Distribution								
Eyes									
Bitot's spots	0.2	0.9				0.7		1.2	0.4
Skin, Face and Neck									
Nasolabial seborrhea	0.7	1.1		1.1				1.5	0.5
Lips									
Angular lesions	1.6	1.4			4.5	0.5		1.2	1.9
Angular scars	1.4	10.9			12.5	0.5		1.8	5.4
Cheilosis		0.9			0.1				0.1
Gums									
Swollen red papillae									
Localized	8.2	12.9	5.2	1.9	11.2	7.7		6.3	8.3
Diffuse	12.2	28.2	5.6	1.9	15.9	6.3		17.1	13.1
Tongue									
Filiform papillary atrophy									
Slight	1.8	1.7		0.3	2.3	1.2		1.5	1.5
Moderate/severe	0.9	0.9		0.3	0.7	0.9		0.2	0.6
Glossitis		0.6			0.2				0.1
Magenta	0.2	0.6			0.7				0.3
Glands									
Thyroid enlarged - Grade I	7.9	5.7	1.9	2.7	2.9	3.5		2.0	3.7
Grades II and III	0.2								0.03
Skin, General									
Follicular hyperkeratosis									
Anywhere	0.9		0.4	1.6	0.5	0.5		0.8	0.6
Arms	0.7		0.4	1.1	0.5	0.5		0.5	0.5
Back	0.4		0.4	0.8	0.4	0.2		0.2	0.4
Thighs	0.2		0.4	0.8	0.3				0.2

TABLE 48 (Continued) CLINICAL FINDINGS BY AGE AND LOCATION, ABBREVIATED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

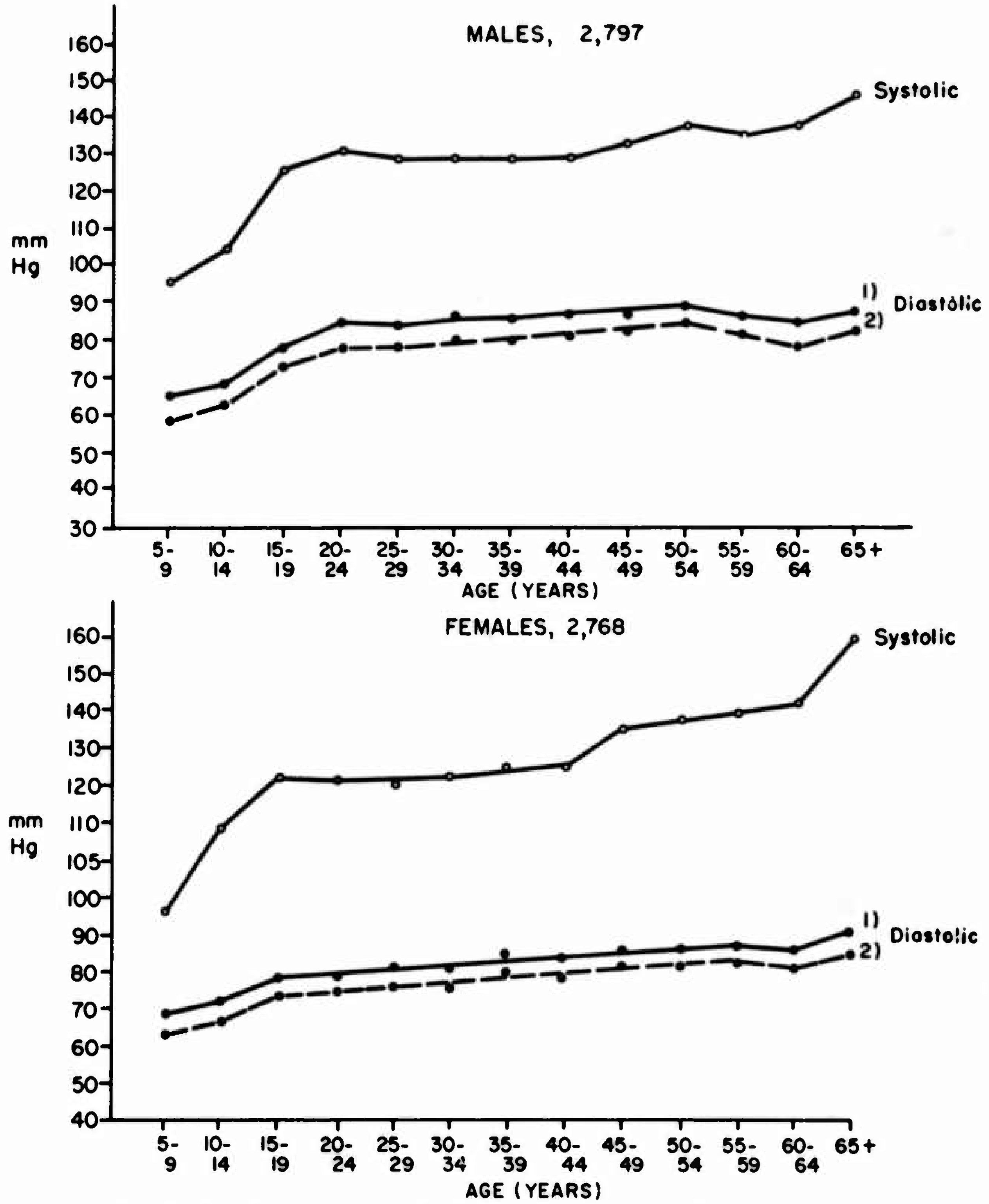
Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
	Males and Females 5-14 Years (Continued)								
Number	441	348	268	367	969	428	14	398	3,233
	Percent Distribution								
Lower Extremities									
Bilateral edema			0.4	0.5	0.1				0.1
Loss of ankle jerk									
Unilateral	0.7	0.6	2.6	1.9	0.4	2.3		1.0	1.1
Bilateral	3.2	1.1	3.7	3.8	2.1	3.3		1.2	2.5
Calf tenderness	0.2		0.8	1.1	0.5	0.5	7.1		0.5
	Males and Nonpregnant, Nonlactating Females 15+ Years								
Number	448	387	356	129	330	160	37	156	2,003
	Percent Distribution								
Eyes									
Bitot's spots		0.2	0.3						0.1
Skin, Face and Neck									
Nasolabial seborrhea	8.9	4.9	11.2	7.8	6.1	10.0	2.7	10.9	8.1
Lips									
Angular lesions	1.3	3.9			4.2	0.6		2.6	2.0
Angular scars	1.6	8.5			20.3	0.6		3.8	5.7
Cheilosis		0.2							0.05
Gums									
Swollen red papillae									
Localized	6.7	16.0	7.9	1.6	9.4	7.5		7.7	8.8
Diffuse	9.8	21.4	18.5	0.8	17.3	13.1		10.2	14.4
Tongue									
Filiform papillary atrophy									
Slight	1.6	2.1	1.7	3.1	1.8	1.9		3.2	1.9
Moderate/severe	0.7	1.0	1.1	1.6	1.8	3.8		1.3	1.3
Glossitis		1.3			0.9				0.4
Magenta	3.8	1.8			2.1			0.6	1.6

TABLE 48 (Continued) CLINICAL FINDINGS BY AGE AND LOCATION, ABBREVIATED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
	Males and Nonpregnant, Nonlactating Females 15+ Years (Continued)								
Number	448	387	356	129	330	160	37	156	2,003
	Percent Distribution								
Glands									
Thyroid enlarged - Grade I	6.9	8.3	7.3	6.2	10.6	23.8		5.1	8.9
Grades II and III	0.7		0.3		0.6				0.3
Skin, General									
Follicular hyperkeratosis									
Anywhere	0.2	1.3	0.3	1.6	0.9			1.3	0.7
Arms	C.2	1.0	0.3	0.8	0.9			1.3	0.6
Back		0.8		0.8	0.3			0.6	0.3
Thighs		0.8		1.6					0.2
Lower Extremities									
Bilateral edema	1.1		1.1	2.3	1.8	0.6			0.9
Loss of ankle jerk									
Unilateral	1.8	0.2	3.9	3.1	1.8	2.5		3.2	2.1
Bilateral	7.8	4.1	18.5	11.6	8.8	6.9	5.4	12.8	9.7
Calf tenderness	0.9		1.1	0.8	0.9	0.6			0.6
	Pregnant and Lactating Women								
Number	18	7	12	22	29	80	1	3	172
	Percent Distribution								
Skin, Face and Neck									
Nasolabial seborrhea	5.6		16.7	9.1	6.9	11.2			9.3
Lips									
Angular lesions		14.3			6.9				1.7
Angular scars		28.6			10.3				2.9

TABLE 48 (Continued) CLINICAL FINDINGS BY AGE AND LOCATION, ABBREVIATED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
			Pregnant and Lactating Women (Continued)						
Number	18	7	12	22	29	80	1	3	172
			Percent Distribution						
Gums									
Swollen red papillae									
Localized	22.2	14.3			6.9	15.0		33.3	11.6
Diffuse	16.7	28.6		4.5	27.6	5.0		66.7	11.6
Tongue									
Filiform papillary atrophy									
Slight	5.6	14.3		4.5		2.5		33.3	3.5
Moderate/severe		14.3			3.4				1.2
Glands									
Thyroid enlarged - Grade I	27.8	28.6		4.5	27.6	18.8		33.3	18.6
Skin, General									
Follicular hyperkeratosis									
Anywhere				9.1					1.2
Thighs				9.1					1.2
Lower Extremities									
Bilateral edema	11.1				6.9	2.5			3.5
Loss of ankle jerk									
Unilateral						1.2			0.6
Bilateral	5.6			4.5		5.0			3.5
Calf tenderness			8.3			1.2			1.2



1) Defined as change of sound 2) Defined as disappearance of sound

FIGURE 18. BLOOD PRESSURE LEVELS BY SEX AND AGE, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

TABLE 49. PERCENT DISTRIBUTION OF HYPERTENSIVE BLOOD PRESSURE MEASUREMENTS BY AGE, SEX AND RACE, ABBREVIATED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Age (years)	15-19	20-24	25-29	30-34	35-39	40-44
Males						
No.	242	111	69	69	63	77
		Percent Distribution				
≥150 (Systolic)	4.5	8.1	13.0	8.7	7.9	16.9
≥100 (Diastolic)	1.2	0.9	7.2	7.2	4.8	13.0
≥150/100 (S/D)	0.4	0.9	7.2	4.3	3.2	10.4
Females, nonpregnant, nonlactating						
No.	223	248	129	124	87	106
		Percent Distribution				
≥150 (Systolic)	2.7	2.8	3.9	3.2	8.0	11.3
≥100 (Diastolic)	0.9	1.6	3.1	4.0	5.7	5.7
≥150/100 (S/D)	--	0.8	1.6	2.4	2.3	4.7

Age (years)	15-19	20-24	25-29	30-34	35+	Total
Pregnant females						
No.	20	61	53	16	12	152
		Percent Distribution				
≥150 (Systolic)	--	--	2.3	--	--	0.6
≥100 (Diastolic)	--	--	2.3	--	--	0.6
≥150/100 (S/D)	--	--	2.3	--	--	0.6
Lactating females						
No.	18	89	49	25	13	194
		Percent Distribution				
≥150 (Systolic)	--	2.2	2.0	4.0	--	2.1
≥100 (Diastolic)	--	1.1	2.0	4.0	--	1.5
≥150/100 (S/D)	--	--	--	--	--	--

rapidly between the ages of 10-15 years (see Appendix Table 43). Thereafter, it was relatively constant until age 40 in the women and the men when there was some rise. By age 55 there was a slight systolic and diastolic decrease in men, but not in women. This diastolic decrease occurred at age 60 in women and is interpreted as indicating the onset of atherosclerotic rigidity of vessels which widens the pulse pressure. By age 65 both men and women had a further increase in both systolic and diastolic pressures.

TABLE 49 (Continued) **PERCENT DISTRIBUTION OF HYPERTENSIVE BLOOD PRESSURE MEASUREMENTS BY AGE, SEX AND RACE, ABBREVIATED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA**

						Race			
45-49	50-54	55-59	60-64	65+	Total	Chinese	Malay	Indian	Other
63	56	75	55	68	948	397	487	61	3
				Percent Distribution					
17.5	21.4	24.0	30.9	42.6	14.8	17.4	13.6	8.2	--
9.5	14.3	8.0	14.5	14.7	6.8	9.1	6.0	--	--
7.9	10.7	8.0	12.7	14.7	5.7	7.8	4.7	--	--
71	92	51	60	63	1,254	419	778	47	10
				Percent Distribution					
26.7	25.0	31.4	30.0	49.2	11.8	15.8	10.0	6.4	10.0
12.7	8.7	13.7	11.7	22.2	5.7	7.9	4.5	4.2	10.0
11.3	8.7	13.7	8.3	22.2	4.5	6.4	3.3	4.2	10.0
						32	108	12	--
							Percent Distribution		
						--	0.9	--	--
						--	0.9	--	--
						--	0.9	--	--
						18	165	11	--
							Percent Distribution		
						--	2.4	--	--
						--	1.8	--	--
						--	--	--	--

Biochemical Survey

Samples of blood and urine were obtained from approximately 550 civilians and military dependents age 5 years and above and 53 children below 5 years of age at 8 locations. A detailed description of the data distribution by sex, age and location is given in Appendix Tables 44 and 45. The procedure for collection of samples and a description of the methods employed can be found in Chapter IV, Procedures and Methods.

Protein Status

In general, the protein nutrition of the civilian and military dependent populations appeared to be good. Of the 591 samples analyzed for total plasma protein, none fell in the "deficient" range and few in the "low" range (Tables 50 and 53 and Appendix Tables 44 and 45). A greater percentage of values for children below the age of 5 years was in the "low" range than for any other group (Table 53). Essentially no "deficient" values were found in plasma globulin or albumin values (see Tables 51-55). However, blood protein levels decline with age, especially in men (see Appendix Tables 44 and 45).

TABLE 50. TOTAL PLASMA PROTEINS BY AGE AND SEX, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Sex		Children	Males		Females		
					Nonpregnant, nonlactating		Pregnant, lactating
Age (years)		<15	15-44	45+	15-44	45+	
No. subjects		267	80	23	111	24	33
gm/100 ml							
Mean		7.3	7.4	7.2	7.5	7.4	7.4
S.E.1/		0.06	0.07	0.11	0.05	0.10	0.10
				Percent Distribution			
<6.00	("Deficient")	--	--	--	--	--	--
6.00-6.39	("Low")	1.9	5.0	--	3.6	--	--
6.40-6.99	("Acceptable")	28.8	13.8	39.1	11.7	16.7	21.2
≥7.00	("High")	69.3	81.2	60.9	84.7	83.3	78.8

1/ S.E. = standard error.

TABLE 51. PLASMA ALBUMIN LEVELS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Sex	Children	Males		Females		
				Nonpregnant, nonlactating		Pregnant, lactating
Age (years)	<15	15-44	45+	15-44	45+	
No. subjects	266	80	23	110	24	33
gm/100 ml						
Mean	3.8	4.0	3.6	3.8	3.7	3.5
S.E.1/	0.06	0.04	0.10	0.05	0.06	0.11
			Percent Distribution			
<2.5	0.8	--	--	0.9	--	3.0
2.5-3.4	22.9	6.2	30.4	14.5	20.8	27.3
3.5-5.0	76.3	92.5	69.6	84.5	79.2	69.7
>5.0	--	1.2	--	--	--	--

1/ S.E. = standard error.

TABLE 52. ALBUMIN/GLOBULIN RATIO, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Sex	Children	Males		Females		
				Nonpregnant, nonlactating		Pregnant, lactating
Age (years)	<15	15-44	45+	15-44	45+	
No. subjects	266	80	23	110	24	33
Mean	1.1	1.2	1.1	1.1	1.0	1.0
S.E.1/	0.04	0.03	0.07	0.03	0.04	0.06
			Percent Distribution			
<0.5	0.4	--	--	0.9	--	3.0
0.5-0.9	28.6	17.5	34.8	26.4	45.8	45.5
1.0-1.4	56.4	61.2	56.5	60.9	50.0	48.5
1.5-1.9	13.2	20.0	4.3	10.9	4.2	3.0
≥2.0	1.5	1.2	4.3	0.9	--	--

1/ S.E. = standard error.

Vitamin Status

Vitamin B-Complex

Thiamine. A "deficient" level of thiamine excretion was found in approximately 20 percent of the civilian and military dependent populations over the age of 14 years, and approximately one third of this same group showed "low" excretion levels. Inadequate thiamine intakes appeared to be less of a problem in children 14 years of age and under (Table 56 and Appendix Tables 44 and 45). However, since children excrete less creatinine than do adults in proportion to the amounts of thiamine they excrete, use of a tentative guide developed to relate B-vitamin excretions to their creatinine excretion levels (see Table 57) indicates that they too are excreting "low" levels of thiamine (Table 58).

Riboflavin. Thirty-eight to 83 percent of the civilian and military dependent groups examined had riboflavin excretion levels in the "deficient" or "low" range. These data indicate an inadequate intake of riboflavin in the majority of the population studied (Table 59 and Appendix Tables 44 and 45). According to the tentative standard discussed under Thiamine, immediately above, a considerable number of children under 5 also excrete "low" levels of riboflavin (see Table 58).

TABLE 53. TOTAL PLASMA PROTEIN LEVELS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA
gm/100 ml

Description		Children		Males and Nonpregnant, Nonlactating Females	Pregnant or Lactating Females
Age (years)		<5	5-14	15+	15+
Number of Subjects		53	267	238	33
Mean		7.0	7.3	7.5	7.4
				Percent Distribution	
<6.00	"Deficient"	--	--	--	--
6.00-6.39	"Low"	13.2	1.9	3.4	--
6.40-6.99	"Acceptable"	30.2	28.8	15.5	21.2
≥7.00	"High"	56.6	69.3	81.1	78.8

TABLE 54. PLASMA GLOBULIN LEVELS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA
gm/100 ml

Description		Children		Males and Nonpregnant, Nonlactating Females	Pregnant or Lactating Females
Age (years)		<5	5-14	15+	15+
Number of Subjects		53	266	237	33
Mean		3.3	3.5	3.6	3.8
				Percent Distribution	
1.0-1.9	"Deficient"	--	0.4	--	--
2.0-2.9	"Low"	34.0	21.4	16.9	6.1
3.0-3.5	"Acceptable"	35.8	37.6	40.5	33.3
>3.5	"High"	30.2	40.6	42.6	60.6

TABLE 55. PLASMA ALBUMIN LEVELS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

gm/100 ml

Description Age (years)		Children <5	 5-14	Males and Nonpregnant, Nonlactating Females 15+	Pregnant or Lactating Females 15+
No. of Subjects		53	266	237	33
Mean		3.7	3.8	3.9	3.6
				Percent Distribution	
<2.5	"Deficient"	---	0.8	0.4	
2.5-3.4	"Low"	34.0	22.9	13.9	3.0
3.5-5.0	"Acceptable"	64.2	76.3	85.2	27.3
>5.0	"High"	1.9	---	0.4	69.7

TABLE 56. THIAMINE EXCRETION, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

μg/gm creatinine

Description Age (years)		Children <5	 5-14	Males and Nonpregnant, Nonlactating Females 15+	Pregnant or Lactating Females 15+
No. of Subjects		36	203	187	25
Median		450	113	63	58
				Percent Distribution	
<27	"Deficient"	---	0.5	19.8	20.0
27-65	"Low"	2.8	21.2	32.6	40.0
66-129	"Acceptable"	5.6	38.4	24.1	32.0
≥130	"High"	91.7	39.9	23.5	8.0

TABLE 57. A TENTATIVE GUIDE FOR THE INTERPRETATION OF THIAMINE AND RIBOFLAVIN EXCRETIONS OF CHILDREN1/

Age Group (years)	"Deficient"	"Low"	"Acceptable"	"High"
		Thiamine (µg/gm creatinine)		
1-3	<120	120-175	176-600	>600
4-6	< 85	85-120	121-400	>400
7-9	< 70	70-180	181-350	>350
10-12	< 60	60-180	181-300	>300
13-15	< 50	50-150	151-250	>250
ICNND Adult	< 27	27-65	66-130	>130
		Riboflavin (µg/gm creatinine)		
1-3	<150	150-499	500-900	>900
4-6	<100	100-299	300-600	>600
7-9	< 85	85-269	270-500	>500
10-15	< 70	70-199	200-400	>400
ICNND Adult	< 27	27-79	80-270	>270

1/ Derived from ICNND interpretative thiamine intake data by assuming NRC (1958) recommended caloric intakes were met for each age group. Intakes of ≤0.2 mg/1,000 Calories were considered to give rise to a 10 percent excretion. Intakes of >0.2 mg/1,000 Calories were considered to give rise to a 20 percent excretion. Expected creatinine coefficients were derived from Stearns et al., Ann. N.Y. Acad. Sci. 69, 857, 1958.

N'-Methylnicotinamide. The intake of niacin or its precursors appeared to be adequate as judged from the excretion of N'-methylnicotinamide. In all groups examined, over 93 percent of the population showed "acceptable" or "high" excretion levels (Tables 60 and 61 and Appendix Tables 44 and 45).

TABLE 58. FREQUENCY DISTRIBUTION OF THIAMINE AND RIBOFLAVIN EXCRETIONS IN MALAYAN CHILDREN BY AGE GROUPS, 0-4

	Thiamine					Riboflavin				
Age (years)	<1	1	2	3	4	<1	1	2	3	4
μg/gm creatinine										
<50					1*			1*	8*	3*
50-99				2*			1*		2*	3*
100-199				1*	2**				3*	
200-299		1	1	2						
300-399				5	1					
400-499		1		2	1				1*	
500-699		1	2	3				1	2	2
700-899			1	1	1			1	2	
900-1,099				1	1			1	1	
1,100-1,299				1						
1,300-1,499		1	1							
>1,499	2					2	2	2	1	
Number	36					39				
Median	450					162				
Percent "low or deficient"	--	--	--	16.6	28.6	--	33.3	16.7	70.0	75.0

Percent Distribution by ICNND Adult Guide

<27	0	<27	15.4
27-65	2.8	27-79	23.1
66-129	5.6	80-269	15.4
≥130	91.7	≥270	46.2

* All values so marked are considered to fall at least in the "low" category in the particular age group in question (see Table 57).

** Half the values so marked would probably fall in the "low" category (see Table 57).

TABLE 59. RIBOFLAVIN EXCRETION, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

µg/gm creatinine

Description Age (years)		Children <5	 5-14	Males and Nonpregnant, Nonlactating Females 15+	Pregnant or Lactating Females 15+
Number of Subjects		39	225	212	29
Median		162	38	34	32
				Percent Distribution	
<27	"Deficient"	15.4	34.7	40.6	48.3
27-79	"Low"	23.1	47.6	42.4	31.0
80-269	"Acceptable"	15.4	15.1	12.3	17.3
≥270	"High"	46.2	2.7	4.7	3.4

TABLE 60. N'-METHYLNICOTINAMIDE EXCRETION, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

mg/gm creatinine

Description Age (years)		Children <5	 5-14	Males and Nonpregnant, Nonlactating Females 15+	Pregnant or Lactating Females 15+
Number of Subjects		36	245	207	31
Median		11.4	7.3	5.2	6.4
				Percent Distribution	
<0.50	"Deficient"	—	0.4	—	—
0.50-1.59	"Low"	—	1.6	6.8	—
1.60-4.29	"Acceptable"	—	17.1	32.4	38.7
≥4.30	"High"	100.0	80.8	60.9	61.3

TABLE 61. N'-METHYLNICOTINAMIDE EXCRETIONS OF MALAYAN CHILDREN 0-4 YEARS

N'-Methylnicotinamide mg/gm creatinine	
No.	36
Median	11.4
	Percent Distribution
<0.5	0
0.5-1.59	0
1.6-4.29	0
≥4.3	100

Vitamin A

There was little evidence of vitamin A insufficiency in the population over 14 years of age. In this group over 85 percent of the population had "acceptable" or "high" plasma vitamin A and carotene levels. In children less than 15 years of age, however, a modest number showed "low" and "deficient" plasma levels, indicating that insufficient intakes might exist in a portion of this population group (see Tables 62 and 63 and Appendix Tables 44 and 45).

Vitamin C

There was little evidence of a vitamin C problem in the population studied (Table 64).

Mineral Status

Anemia

The data indicate that a moderate anemia problem does exist in the population examined (see Tables 65, 66 and 67 and Appendix Tables 44-47). Hemoglobin levels decrease with age, especially in men (see Appendix Table 45).

Iodine

The values obtained for urinary iodine excretion in the civilian and military dependent groups indicate a need for an increased dietary intake of iodine. Over 50 percent of all groups had an iodine excretion of less than 50 μg per gram of creatinine, an excretion level indicative of an inadequate intake of this mineral (Table 68). There was no correlation between iodine excretion and the prevalence of goiter (Appendix Table 48).

Plasma Lipids

Plasma cholesterol, lipid phosphorus and β-lipoprotein values were similar to values reported from Western nations (Table 69). Cholesterol levels in men rise insignificantly with age (see Appendix Table 45). Women, in contrast to Western countries, have a higher mean level than men.

TABLE 62. PLASMA VITAMIN A LEVELS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

μg/100 ml

Description		Children		Males and Nonpregnant, Nonlactating Females	Pregnant or Lactating Females
Age (years)		<5	5-14	15+	15+
Number of Subjects		49	265	232	33
Mean		29.0	28.5	38.5	29.9
				Percent Distribution	
<10	"Deficient"	2.0	4.2	1.7	3.3
10-19	"Low"	18.4	21.1	6.0	12.1
20-49	"Acceptable"	73.5	64.5	73.3	84.6
≥50	"High"	6.1	10.2	19.0	---

TABLE 63. PLASMA CAROTENE LEVELS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

μg/100 ml

Description		Children		Males and Nonpregnant, Nonlactating Females	Pregnant or Lactating Females
Age (years)		<5	5-14	15+	15+
Number of Subjects		49	265	232	33
Mean		62	76	90	92
				Percent Distribution	
<0.10	"Deficient"	4.1	0.4	0.9	---
0.10-0.19	"Low"	26.5	11.7	6.5	6.0
0.20-0.39	"Acceptable"	57.1	68.7	58.2	57.6
≥0.40	"High"	12.2	19.2	34.5	36.4

TABLE 64. PLASMA VITAMIN C LEVELS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

mg/100 ml

Description		Children		Males and Nonpregnant, Nonlactating Females	Pregnant or Lactating Females
Age (years)		<5	5-14	15+	15+
Number of Subjects		38	248	231	31
Mean		0.92	0.73	0.53	0.22
				Percent Distribution	
<0.10	"Deficient"	---	---	0.9	---
0.10-0.19	"Low"	5.3	2.0	10.4	6.6
0.20-0.39	"Acceptable"	10.5	23.4	28.6	54.8
≥0.40	"High"	84.2	74.6	60.2	38.6

TABLE 65. HEMOGLOBIN LEVELS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

gm/100 ml

Description		Children		Males and Nonpregnant, Nonlactating Females	Pregnant or Lactating Females
Age (years)		<5	5-14	15+	15+
Number of Subjects		59	266	236	35
Mean		12.1	13.2	13.6	12.5
				Percent Distribution	
<12.0	"Deficient"	35.6	12.8	16.9	34.3
12.0-13.9	"Low"	59.3	57.5	35.2	40.0
14.0-14.9	"Acceptable"	3.4	22.2	24.6	20.0
≥15.0	"High"	1.7	7.5	23.3	5.7

TABLE 66. PLASMA CORPUSCULAR VOLUME (HEMATOCRIT), CIVILIANS AND MILITARY DEPENDENTS, MALAYA

percent

Description		Children		Males and Nonpregnant, Nonlactating Females	Pregnant or Lactating Females
Age (years)		<5	5-14	15+	15+
Number of Subjects		60	258	231	34
Mean		35.3	39.2	41.0	36.8
				Percent Distribution	
<36	"Deficient"	50.0	10.5	11.7	32.4
36-41	"Low"	48.3	67.0	42.4	50.0
42-44	"Acceptable"	---	16.7	19.9	11.7
≥45	"High"	1.7	5.8	26.0	5.9

TABLE 67. MEAN CORPUSCULAR HEMOGLOBIN CONCENTRATION, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

percent

Description	Children		Males and Nonpregnant, Nonlactating Females	Pregnant or Lactating Females
Age (years)	<5	5-14	15+	15+
Number of Subjects	52	258	226	34
Mean	33.8	33.7	33.3	34.2
			Percent Distribution	
<28.0	3.8	4.6	6.2	---
28.0-29.9	7.7	3.5	8.0	3.8
30.0-31.9	7.7	14.7	15.0	19.2
≥32.0	80.8	77.1	70.8	76.9

TABLE 68. URINARY IODINE EXCRETIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

μg/gm creatinine

Description	Children		Males and Nonpregnant, Nonlactating Females	Pregnant or Lactating Females
Age (years)	<5	5-14	15+	15+
No. of Subjects	--	82	53	3
Mean	--	53	135	51
			Percent Distribution	
<50	--	67.1	54.7	66.7
50-99	--	24.4	30.2	33.3
≥100	--	8.5	15.1	--

TABLE 69. PLASMA CHOLESTEROL, LIPID PHOSPHORUS AND β-LIPOPROTEIN LEVELS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Description	Children		Males and Nonpregnant, Nonlactating Females	Pregnant or Lactating Females
Age (years)	<5	5-14	15+	15+
Cholesterol mg/100 ml				
Number of Subjects	54	263	239	33
Mean	161	171	193	195
Lipid Phosphorus mg/100 ml				
Number of Subjects	53	263	236	32
Mean	8.7	9.7	10.0	10.6
β-Lipoprotein mm				
Number of Subjects	52	194	165	27
Mean	2.9	2.6	2.8	2.7

TABLE 70. THE ORAL HEALTH STATUS OF CIVILIAN MALES BY AGE, FEDERATION OF MALAYA, 1962

Age (years)	DMF 1/		PI 2/		Attrition		Recession		Debris		Calculus		OHI 3/	
	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean
0-4	56	0.00	56	0.025	2	0.000	56	0.0	56	1.280	56	0.018	56	1.298
5-9	380	1.10	380	0.086	345	0.010	380	0.0	379	1.503	379	0.046	379	1.549
10-14	368	3.10	368	0.150	366	0.181	367	0.1	366	1.450	366	0.345	366	1.795
15-19	123	5.79	123	0.163	122	0.842	122	11.1	123	1.028	123	0.545	123	1.573
20-24	78	4.43	78	0.268	77	1.079	78	34.7	78	1.098	78	0.795	78	1.893
25-29	53	5.96	53	0.777	53	1.094	53	10.5	53	1.268	53	0.979	53	2.247
30-34	43	5.32	43	1.249	42	1.290	42	19.8	43	1.416	43	1.244	43	2.660
35-39	36	5.80	35	1.234	35	1.608	35	23.4	35	1.608	35	1.368	35	2.977
40-44	44	7.86	43	2.828	42	1.657	42	35.8	42	1.638	42	1.300	42	2.938
45-49	32	11.78	28	3.714	27	1.863	27	50.3	27	1.644	27	1.507	27	2.152
50+	134	19.35	108	5.013	87	2.058	104	67.6	102	1.676	102	1.456	102	3.132
Total and Mean	1,347	4.97	1,315	0.787	1,198	0.603	1,306	9.5	1,304	1.421	1,304	0.514	1,304	1.935

1/ Diseased, missing, filled.
2/ Periodontal Index.
3/ Oral Hygiene Index.

TABLE 71. THE ORAL HEALTH STATUS OF CIVILIAN MALES BY AREA OF ORIGIN, FEDERATION OF MALAYA, 1962

Area of Origin	DMF 1/		PI 2/		Attrition		Recession		Debris		Calculus		OHI 3/	
	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean
Selangor	226	2.42	225	0.252	194	0.235	225	3.7	225	1.293	225	0.340	225	1.633
Kelantan	146	11.59	130	2.042	123	0.961	130	25.8	129	1.592	129	0.725	129	2.318
Pahang	146	2.75	144	0.437	121	0.265	144	5.4	144	1.492	144	0.252	144	1.744
Johore	178	4.30	178	0.565	167	0.442	178	7.5	178	1.501	178	0.634	178	2.135
Malacca/Negri Sembilan	128	5.59	125	0.990	115	0.742	123	11.3	122	1.336	122	0.633	122	1.969
Perak	255	2.23	255	0.328	233	0.336	254	2.3	253	1.477	253	0.251	253	1.728
Kedah	191	5.83	187	0.704	184	1.008	181	6.6	185	1.262	185	0.674	185	1.936
Trengganu	3	5.33	3	0.167	3	1.400	3	11.3	3	1.100	3	1.100	3	2.200
Penang	5	15.00	4	2.300	4	0.550	4	24.2	4	1.225	4	0.900	4	2.125
All others			64	3.083	54	3.083	64	49.5	61	1.575	61	1.303	61	2.878

1/ Diseased, missing, filled.
2/ Periodontal Index.
3/ Oral Hygiene Index.

Oral Health Status of Civilian Males

The oral health status of civilian males in Malaya is shown by age in Table 70 and by area of origin in Table 71. The oral health status of civilian males is shown by religion in Table 72.

TABLE 72. THE ORAL HEALTH STATUS OF CIVILIAN MALES ACCORDING TO RACE

Oral Condition	Race: Malayan No.	Malayan Mean score	Chinese No.	Chinese Mean score	Other No.	Other Mean score
DMF 1/	719	5.75	471	4.52	157	2.66
PI 2/	693	0.977	465	0.567	157	0.604
Attrition	632	0.718	422	0.468	144	0.498
Recession	687	11.3	465	7.7	155	7.7
Debris	685	1.459	461	1.402	157	1.282
Calculus	685	0.622	465	0.344	157	0.540
OHI 3/	685	2.082	465	1.746	157	1.822

1/ Diseased, missing, filled.
2/ Periodontal Index.
3/ Oral Hygiene Index.

Some comparisons made in Figure 19 between the diseased, missing and filled (DMF) rates of Malayan, Thai and American males and females show that the mean numbers of DMF of the Thai males and females is much less than those of the other groups, that the DMF rates are quite similar for Malayan civilian males and females, the Malayan female military dependents and males and females in Colorado Springs, Colorado (U.S.A.), and that the DMF rates of males in Baltimore, Maryland (U.S.A.) are greater than those of the other groups. The DMF rate of the civilian males in Malaya increased until about 14 years of age but remained relatively constant between 15 and 39 years of age. After 40 years of age the DMF rate of Malayan males rises sharply to 19.35 in the over-50 age group. The over-all mean DMF rate for all civilian males examined in Malaya (1,347) was 4.97.

The Periodontal Index (PI) of civilian males increased steadily through all age groups to reach a high of 5.013 in the over-50 age group. The mean PI for 1,315 individuals examined was 0.787. No attrition was found in the 0 to 4 year age group, but attrition progressed steadily through the other age groups to reach a high of 2.058 in the over-50 age group, the over-all mean being 0.603. The PI of civilian males of some Southeast Asia countries are compared in Table 73. No recession was found in the Malayan civilian males under the ages of 10 to 14 years. Recession did not always increase progressively with age, but reached a high of 67.6 in the over-50 age group, the over-all mean being 9.5. Debris was relatively heavy and at about the same level in all age groups. The most debris was found in the over-50 age group (1.676), the over-all mean being 1.421. Calculus, on the other hand, increased steadily through the progressive age groups to reach a high of 1.507 in the 40 to 44 year age group and 1.456 in the over-50 age group. The over-all mean calculus score was 0.514. The over-all mean Oral Hygiene Index (OHI) was 1.935, with a high of 3.132 in the over-50 age group. The OHI of civilian males of several Southeast Asia countries is compared in Table 74.

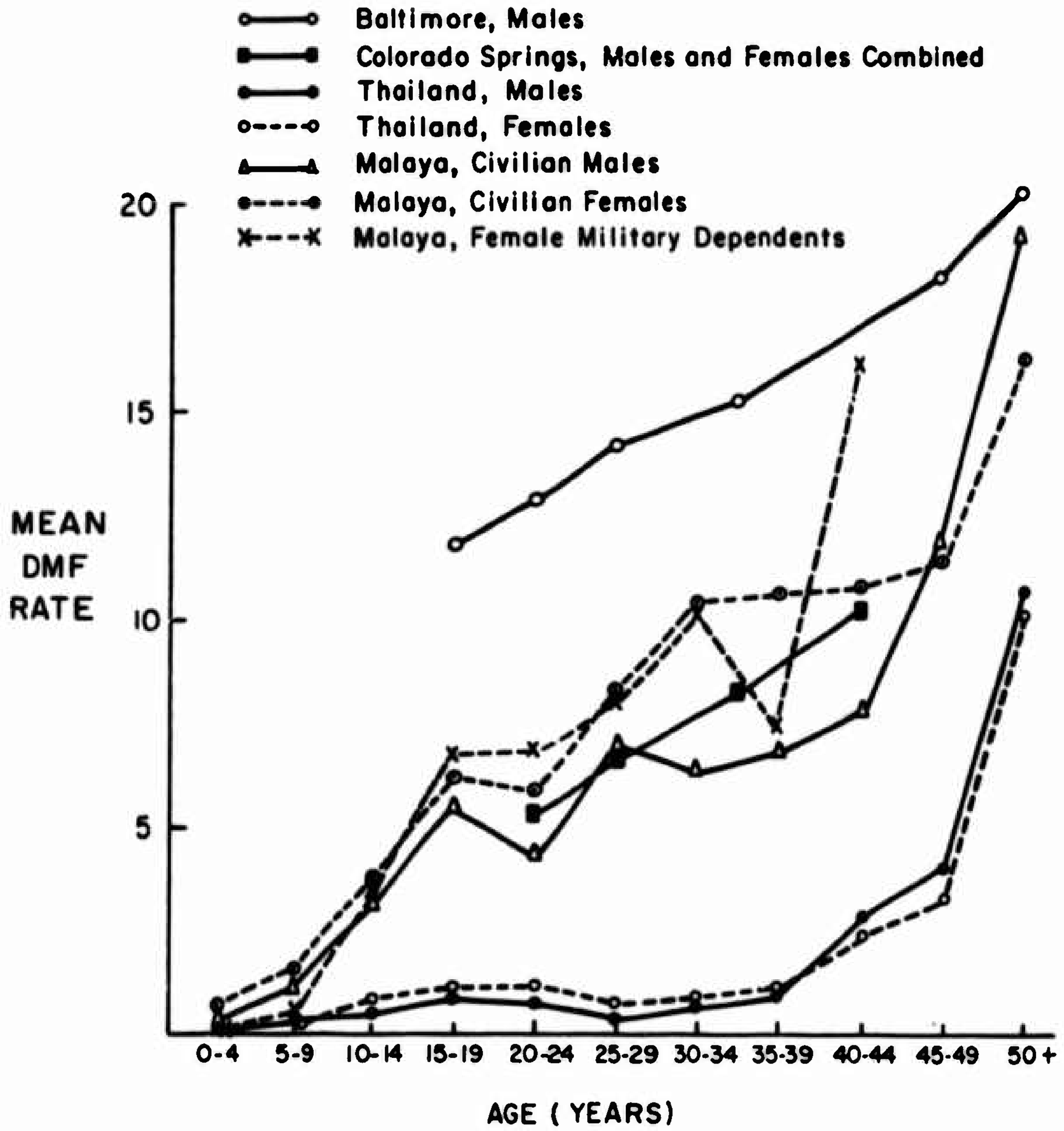


FIGURE 19. A COMPARISON OF THE DMF RATES OF CIVILIANS IN MALAYA AND THAILAND WITH TWO LOCATIONS IN THE UNITED STATES

TABLE 73. A COMPARISON OF THE PERIODONTAL INDICES OF CIVILIAN MALES OF SOUTHEAST ASIA COUNTRIES1/

Age (years)	Country: Malaya	Thailand (1)	Burma (2)	Republic of Vietnam (8): Vietnamese Ethnic Groups	Republic of Vietnam (8): Vietnamese Highlanders
0-4	0.02	0.04	0.00	0.04	0.10
5-9	0.08	0.22	0.60	0.25	0.22
10-14	0.15	0.43	0.58	0.45	0.37
15-19	0.16	0.59	1.21	0.93	0.93
20-24	0.27	1.22	1.52		
25-29	0.78	1.58		1.26	1.95
30-34	1.25	2.28	2.53		
35-39	1.23	3.06		2.18	3.03
40-44	2.83	2.94	3.81		
45-49	3.71	5.21		4.13	5.09
50+	5.01	5.61	5.30		

1/ Numbers in parentheses refer to references.

TABLE 74. A COMPARISON OF THE ORAL HYGIENE INDICES OF CIVILIAN MALES OF SOUTHEAST ASIA COUNTRIES1/

Age (years)	Country: Malaya	Thailand (1)	Burma (2)
0-4	1.30	1.45	0.00
5-9	1.55	2.03	1.98
10-14	1.80	2.35	2.08
15-19	1.57	2.55	2.13
20-24	1.89	2.95	2.46
25-29	2.25	3.50	
30-34	2.66	3.54	2.85
35-39	2.98	4.04	
40-44	2.94	3.88	3.58
45-49	2.15	4.56	
50+	3.13	4.78	4.52

1/ Numbers in parentheses refer to references.

The highest DMF rate of male civilians according to area of origin was Penang with 15.00 and Kelantan with 11.59 (Table 71). Perak had the lowest DMF (2.23). Penang also had the highest PI (2.300) with Kelantan closely following (2.042). There was no definitive geographic pattern with regard to attrition, recession, debris, calculus, or OHI among male civilians.

When the oral health status of the civilian males is computed according to race (Table 72) no definite pattern can be found, although there are some individual variations.

TABLE 75. THE ORAL HEALTH STATUS OF CIVILIAN FEMALES BY AGE, FEDERATION OF MALAYA, 1962

Age (years)	DMF[1]		PI[2]		Attrition		Recession		Debris		Calculus		OHI[3]	
	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean
0-4	53	0.09	53	0.019	5	0.000	53	0.0	53	1.279	53	0.009	53	1.288
5-9	376	1.40	376	0.095	346	0.032	376	0.0	375	1.489	375	0.067	375	1.556
10-14	261	3.69	260	0.107	259	0.222	260	0.1	260	1.254	260	0.266	260	1.520
15-19	88	6.17	88	0.108	88	0.771	88	7.1	88	0.902	88	0.383	88	1.285
20-24	53	5.92	53	0.353	51	0.870	53	3.5	53	1.213	53	0.781	53	1.994
25-29	64	7.14	64	0.679	63	1.068	64	7.1	64	1.256	64	0.895	64	2.151
30-34	66	10.33	65	1.440	56	1.146	65	15.8	64	1.272	64	0.925	64	2.197
35-39	46	10.60	44	1.488	42	1.497	44	25.2	44	1.032	44	0.950	44	1.982
40-44	58	10.62	57	1.966	50	1.634	57	32.5	56	1.480	56	1.168	56	2.648
45-49	43	11.46	39	2.920	34	2.017	39	42.2	39	1.700	39	1.346	39	3.046
50+	137	16.23	120	3.991	91	2.101	119	57.0	109	1.475	109	1.252	109	2.727
Total and Mean	1,245	5.87	1,219	0.821	1,085	0.656	1,218	10.8	1,205	1.339	1,205	0.483	1,205	1.822

1/ Diseased, missing, filled.
2/ Periodontal Index.
3/ Oral Hygiene Index.

TABLE 76. THE ORAL HEALTH STATUS OF CIVILIAN FEMALES BY AREA OF ORIGIN, FEDERATION OF MALAYA, 1962

Area of Origin	DMF 1/		PI 2/		Attrition		Recession		Debris		Calculus		OHI 3/	
	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean	No.	Mean
Selangor	197	3.62	196	0.349	197	0.335	196	5.2	196	1.257	196	0.377	196	1.635
Kelantan	148	9.00	136	1.529	126	0.881	136	18.1	136	1.464	136	0.708	136	2.172
Pahang	147	4.56	169	0.697	147	0.525	169	7.8	166	1.367	166	0.450	166	1.818
Johore	128	5.82	128	0.694	111	0.495	128	7.8	126	1.435	126	0.559	126	1.995
Malacca/Negri Sembilan	198	6.86	97	1.261	84	0.820	97	15.8	97	1.297	97	0.516	97	1.813
Perak	235	3.51	235	0.373	214	0.449	235	4.5	233	1.466	233	0.258	233	1.724
Kedah	150	5.15	149	0.398	147	0.761	149	5.1	149	1.076	149	0.389	149	1.405
Trengganu	1	8.00	1	0.000	1	0.400	1	0.0	1	1.000	1	0.000	1	1.000
Penang	10	10.20	10	0.120	10	0.775	10	32.0	10	1.120	10	0.470	10	1.590
All others	108	13.91	98	2.520	75	1.668	97	40.6	91	1.316	91	1.033	91	2.349

1/ Diseased, missing, filled.
2/ Periodontal Index.
3/ Oral Hygiene Index.

Oral Health Status of Civilian Females

The oral health status of civilian females in Malaya is shown by age in Table 75, by area of origin in Table 76, and by race in Table 77. The mean numbers of DMF teeth of civilian females increased steadily during the earlier years to reach a level of about 6.0 during the period between 15 and 24 years of age (Table 75). Between 30 and 44 years of age the mean numbers of DMF teeth remained relatively constant at about 10.00, after which the mean DMF rate increased to 16.23 in the over-50 age group.

TABLE 77. THE ORAL HEALTH STATUS OF CIVILIAN FEMALES ACCORDING TO RACE, FEDERATION OF MALAYA, 1962

Oral condition	Race: Malayan No.	Malayan Mean score	Chinese No.	Chinese Mean score	Other No.	Other Mean score
DMF1/	646	5.76	463	6.88	136	2.99
PI2/	629	0.889	454	0.797	136	0.583
Attrition	565	0.707	395	0.644	125	0.458
Recession	630	10.4	452	12.2	136	7.6
Debris	626	1.331	443	1.364	136	1.294
Calculus	626	0.536	443	0.417	136	0.456
OHI3/	626	1.867	443	1.781	136	1.751

1/ Diseased, missing, filled.
2/ Periodontal Index.
3/ Oral Hygiene Index.

The PI in the civilian females increased steadily with progressing age groups, to reach nearly 4 in the over-50 age group. The PI of civilian females of several Southeast Asia countries are compared in Table 78. Attrition was first noted in the 5 to 9 year age group and increased steadily thereafter to reach a high of 2.101 in those over 50 years of age (Table 75). Recession was not seen in those less than 10 to 14 years of age and increased steadily thereafter to reach a high of 0.570 in the over-50 age group. Debris occurred at a relatively high level in all age groups, being greatest in the 45 to 49 year age group. Calculus, however, did increase with age, reaching the highest level in the 45 to 49 year age group. The OHI was also highest in the 45 to 49 year age group (3.046), generally increasing with age. The OHI of civilian females of several Southeast Asia countries is compared in Table 79.

In determining the status of oral health according to area of origin, no definitive pattern occurred within the principal states in Malaya. In the female civilians the DMF rate ranged from 3.62 in Selangor to 9.00 in Kelantan, 10.20 in Penang, and 13.91 for those originating principally outside of Malaya. Likewise, PI was highest for those originating outside of Malaya (2.520). Within the States of Malaya, females originating from Kelantan had the highest PI (1.529). Likewise, attrition (1.668) and recession (40.6) were highest in those originating principally outside of Malaya. Within the States of Malaya, attrition varied about two-fold (0.335 vs. 0.881). Recession was highest in those originating from Penang (32.0), followed by Kelantan (18.1). Excluding Trengganu (from which only one

TABLE 78. A COMPARISON OF THE PERIODONTAL INDICES OF CIVILIAN FEMALES OF SOUTHEAST ASIA COUNTRIES[1/]

Age (years)	Country				
	Malaya	Thailand (1)	Burma (2)	Republic of Vietnam (8) Vietnamese Ethnic Groups	Republic of Vietnam (8) Vietnamese Highlanders
0-4	0.02	0.04	0.30	0.00	0.00
5-9	0.09	0.24	0.51	0.17	0.29
10-14	0.11	0.32	0.61	0.31	0.30
15-19	0.11	0.31	0.55	0.51	1.10
20-24	0.35	0.87	0.97		
25-29	0.68	1.17		1.25	2.39
30-34	1.44	1.62	2.22		
35-39	1.49	2.28		1.33	3.51
40-44	1.96	3.06	3.78		
45-49	2.92	2.93		3.78	5.54
50+	3.99	5.41	5.04		

1/ Numbers in parentheses refer to references.

TABLE 79. A COMPARISON OF THE ORAL HYGIENE INDICES OF CIVILIAN FEMALES OF SOUTHEAST ASIA COUNTRIES[1/]

Age (years)	Country		
	Malaya	Thailand (1)	Burma (2)
0-4	1.29	1.23	0.00
5-9	1.55	1.77	1.70
10-14	1.52	2.00	1.64
15-19	1.28	2.00	1.55
20-24	1.99	2.55	2.29
25-29	2.15	2.88	
30-34	2.19	3.12	3.06
35-39	1.98	3.42	
40-44	.65	3.61	3.69
45-49	3.04	3.67	
50+	2.73	4.54	4.59

1/ Numbers in parentheses refer to references.

individual originated), Perak had the lowest amount of recession (4.5). The levels of debris were relatively constant from one area to another, not exceeding 1.5 and being not less than 1.0 in any area. Excluding Trengganu, individuals originating from Kelantan had the most calculus (0.708) and Perak the least (0.258). On the other hand, females originating outside of Malaya had the greatest amount of calculus (1.033) and the highest OHI (2.349). Within the States in Malaya, Kelantan had the highest OHI (2.172), the OHI of the other States generally being above 1.5 (Table 76).

With regard to race, the mean numbers of DMF are approximately two-fold greater in the Malayans and Chinese than are those belonging to other racial groups (Table 77). With regard to other oral conditions no great variations were found between the different racial groups. (See Appendix Tables 50-65 for other dental data for Malaya.)

Dietary

Population Sample

The dietary survey of civilian families was carried out in seven states (see Table 7). The methods used are described in Chapter IV of this report (Procedures and Methods). Dietary interviews using 24-hour recall questionnaires (see Appendix 6) were carried out at all civilian locations (Table 80). Studies involving food weighing and food sampling for composite analysis were carried out in 9 kampongs (villages) in 6 states (see Tables 8 and 80).

Food Supply

The local kampong market in the rural areas and the town market in the urban areas is the center of the fresh food supply. Marketing is done daily for fresh produce, fish and meat, as refrigeration is not available for these items. Some families buy staple items daily too. The "traveling salesman" seen in most areas is a vital link in the home economics of the kampong, for he brings a number of food items to the consumers as he travels about the country on bicycle.

There is little leftover food in the Malayan household. So closely does the housewife know and estimate her family's intake that the few leftovers are usually given to the chickens and ducks. Almost every kampong household has coconut trees which provide a continuous supply of coconut milk for daily cooking. Although as a rule very little meat is included in the daily Malay diet, the Chinese have meat more often than the other groups studied. Fish, both dry salted and fresh, is the main source of animal protein in the Malay diet. (Some types of fish included in the intake study of Malay families are listed in Appendix 66).

A great variety of vegetables is produced in Malaya, especially dark green and leafy. Thus an excellent dietary source of such nutrients as calcium, vitamins A and C, iron and folic acid should be available. Some native fruits such as the rambutan supply 48 mg of vitamin C per 100 gm serving. The banana grows in great supply throughout the country and in a wide variety of species, some of which are used exclusively for cooking. Appendix 67 lists some of the vegetables and fruits commonly found in the Malayan diet. In the kampongs, some families were growing vegetables for table use. Frequently one garden was shared by many of the family's relatives. Many householders had one or more fruit trees whose produce was likewise shared. The greater amount of vegetables consumed by the families was purchased locally. Little or no fruit is purchased except in season.

Wheat flour exported from the United Kingdom or Australia is used by the Malays to make some of their common breakfast items such as roti chenai, apam balek, kueh kodok and the favorite pisang goreng. (A description of these and other customary diet items is given in Appendix 36).

A large number of condiments such as chillies, onions, ginger, turmeric, soy sauce, belachan (fish paste), ikan bilis (tiny dried fish), etc., are used in soups, curries and side dishes. While these items are consumed in small

TABLE 80. COMPOSITION OF CIVILIAN DIETARY SAMPLE INTERVIEWED BY QUESTIONNAIRE METHOD, MALAYA

Location	Kelantan	Pahang	Johore	Malacca	Selangor	Perak	Kedah	Total
No. families	11	6	19	20	25	24	2	107
No. individuals	58	33	110	119	188	157	13	678
Ave. no. per household	5.2	5.5	5.7	5.9	7.5	6.5	6.5	6.3
Age (years)								
<1	4	3	3	5	10	6	1	32
1-3	4	5	11	8	13	9	1	51
4-6	3	4	13	14	20	16	3	73
7-9	5	4	14	14	25	13	-	75
10-12	6	3	15	15	20	17	2	78

	Kelantan		Pahang		Johore		Malacca		Selangor		Perak		Kedah		Total	
	M[1]	F[1]	M	F	M	F	M	F	M	F	M	F	M	F	M	F
13-15	1	3	1	-	3	4	6	6	8	12	10	5	-	1	29	31
16-19	4	4	-	1	4	-	5	5	3	11	5	5	-	1	21	27
20-59	10	5	6	3	21	19	20	18	30	25	30	31	2	2	119	103
60+	2	2	-	-	-	-	-	-	2	3	3	4	-	-	7	9
No. lactating women		4		2		1		3		6		2		-		18
No. pregnant women		1		1		2		-		-		1		-		5

1/ M = male; F = female.

TABLE 81. COMPOSITION OF 25 CIVILIAN HOUSEHOLDS SURVEYED BY RECIPE METHOD, MALAYA

Location	Kelantan		Pahang		Johore		Malacca		Perak		Kedah		Total	
No. households	2		3		4		4		8		4		25	
No. individuals	11		24		38		24		46		20		163	
Ave. no. per household	5.5		7.6		7.5		6.2		5.2		4.5		6.3	
Age (years)														
<1	2		1		--		1		2		1		7	
1-3	2		3		4		1		6		1		17	
4-6	1		4		6		--		8		1		20	
7-9	3		5		5		5		7		--		25	
10-12	--		4		7		3		4		3		21	
	M[1/]	F[1/]	M	F	M	F	M	F	M	F	M	F	M	F
13-15	--	--	--	1	2	1	--	1	--	1	2	--	4	4
16-19	--	--	--	--	2	--	--	2	--	--	3	--	5	2
20-59	1	--	3	3	3	7	5	4	8	8	4	4	24	26
60+	--	--	--	--	1	--	1	1	--	2	1	--	3	3
No. lactating women		2		--		--		--		--		--		2
No. pregnant women		--		--		--		--		--		--		0

1/ M = male; F = female.

amounts, most of them may contribute to the nutritive value of the diet. Appendix Table 68 represents the daily intake of foods in grams per standard man per day for the families included in the home dietary study.

Food Preparation

Food preparation among the civilian population does not differ significantly from that in the military dependent population. However, in the kampongs (small villages) cooking is done on an open wood fire, seldom on a stove.

The breakfast meal is usually eaten quite early in the kampong, and among Malays does not include rice, except for some occasional leftovers. The food for the other two meals may be prepared once a day, following the morning visit of the husband or wife to the market, and the arrival of the "traveling salesman" at the kampong. The cooked food is then reheated for the evening meal which is usually taken about 7 or 8 pm. Rice, however, is cooked fresh for each meal in all households. Malay housewives are very particular when marketing that produce and fish be fresh.

Fresh fish and meat are prepared as gulai or curry (see Appendices 36 and 69). Salt fish and fresh fish may also be fried in coconut oil as "ikan goreng." Fish is fried until the bones are soft. The cooking loss of fried fish in some instances was found to be in excess of 50 percent of the original weight.

Vegetables and some fruits, such as papaya and jantong, are prepared by cooking in santan or water, or frying in coconut oil. To the vegetables may be added some of the very small dried ikan bilis and a paste made of such condiments as fresh or dry chillies, garlic, onion, halia, kunyit and belachan. This sambal or paste is made in a granite mortar or rolled on a granite slab. Such vegetable dishes are known as tumis, gulai, or goreng (see Appendices 36 and 69).

Rice is washed three times in cold water before cooking, then covered with water and cooked in a covered aluminum or iron pot until all the water has evaporated. Rice cooked in this manner increases in weight 2 to 3 times the weight of dry raw rice. In homes where cooking methods were observed, the average cooking time for rice was twenty minutes. Very few families were using home-pounded or brown rice. The greater number, even those producing their own rice for home consumption, were using fully milled or white rice. It was also observed that some paddy planters sell all or most of their crop and do not keep rice for their own consumption. The average rice consumption in grams per person per day is presented in Table 82.

TABLE 82. AVERAGE RICE CONSUMPTION PER STANDARD MAN PER DAY FOR 25 MALAY FAMILIES (Recipe Method)

State	Weight (gm) As Purchased	Weight (gm) Edible Portion
Kelantan	281	677
Pahang	389	1,012
Johore	300	802
Malacca	430	852
Perak	340	930
Kedah	252	668

Water Supply and Sanitation

Safe water supply and sewage disposal systems are nonexistent in most kampongs, even those near urban areas. Adequate waste disposal is needed to establish standards of sanitation. Most kampongs have rivers and streams for a water supply. This water is carried to the house for use. Some kampongs, especially those of the new Federal Land Development Program, now have wells as a source of water supply.

Food Consumption

Calories

A comparison of the average nutrient intake determined by each method for areas included in the survey may be found in Table 83. A reasonably good agreement is found in the results of the three methods.

TABLE 83. A COMPARISON OF THREE METHODS FOR DETERMINING NUTRIENT INTAKE OF MALAY CIVILIANS PER STANDARD MAN PER DAY

Nutrient	Food Composite 1/ Analysis	Food Weighing 1/ (Recipe)	Questionnaire 2/
Calories	2,744	2,783	2,140
Protein, gm	75.5	75.5	59.7
Fat, gm	62	73	51
Carbohydrate, gm	466	452	414
Calcium, gm	0.51	0.67	0.22
Iron, mg	29.0	10.5	6.88
Vitamin A, IU	1,681	1,930	1,244
Thiamine, mg	>0.68	1.0	0.68
Riboflavin, mg	0.70	0.81	1.04
Niacin, mg	14.3	15.0	10.06
Vitamin C, mg	24.0	45.0	42.0

1/ Average for six states.
2/ Average for seven states.

Caloric intakes appear to be adequate in most locations. Caloric intake varied between 2,150 and 3,200 per standard man per day by chemical analysis of the cooked food composites (see Table 84) and from 2,373 to 3,30C by analysis of the raw food composite samples (Table 85). These values were higher than those obtained by either the recipe (Table 86) or the questionnaire method (Table 87). Table 43 presents the percent of total Calories derived from protein, fat and carbohydrate in the military dependent and civilian populations.

Protein

The protein intake for all areas appears "acceptable" according to the ICNND reference guide by all three methods, and adequate when compared to

TABLE 84. NUTRIENT INTAKE OF 25 MALAY CIVILIAN FAMILIES PER STANDARD MAN PER DAY
(Cooked Food Composite)

Location	No. Families	No. Persons	Standard Man Per Location[1/]	Calories	Protein gm	Fat gm	Carbo-hydrate gm	Calcium gm	Iron mg	Vitamin A IU	Thia-mine mg
Kelantan[2/]	2	9	6.15	2,150	61.0	30.0	500	0.36	31	<1,200	<0.7
Pahang	3	23	15.4	3,200	100.0	67.0	575	1.13	24	<1,150	<0.8
Johore	4	38	27.4	3,020	85.0	78.0	513	0.60	66	1,253	0.8
Malacca	4	23	17.5	2,895	84.0	80.0	460	0.80	24	2,164	0.8
Perak	8	44	29.9	2,330	63.0	63.8	375	0.89	20	1,760	<0.73
Kedah	4	19	16.6	2,800	60.0	60.0	503	0.30	23	3,413	0.56

Location	Ribo-flavin mg	Niacin mg	Vitamin C mg	Vitamin B_6 mg	Folic Acid mg	NaCl gm
Kelantan[2/]	1.0	12.0	20.0	0.7	0.3	3.3
Pahang	0.9	16.0	33.0	1.7	0.62	11.0
Johore	0.8	28.0	8.0	1.2	0.6	6.3
Malacca	0.7	11.0	21.0	0.96	0.55	9.8
Perak	0.66	9.0	33.0	0.7	0.66	6.7
Kedah	0.6	2.6	29.5	1.1	0.54	9.7

1/ Children less than one year of age are not included in these calculations.
2/ A sample from one family in this location contained buffalo liver.

TABLE 85. NUTRIENT INTAKE OF 25 MALAY CIVILIAN FAMILIES PER STANDARD MAN PER DAY
(Raw Food Composite)

Location	No. Families	No. Persons	Standard Man Per Location 1/	Calories	Protein gm	Fat gm	Carbo-hydrate gm	Calcium gm	Iron mg	Vitamin A IU	Thia-mine mg
Kelantan 2/	2	9	6.15	2,530	61	46.0	468	0.33	30.0	>1,209	<0.7
Pahang	3	23	15.4	2,648	88	70.0	416	1.5	21.4	8,050	<0.7
Johore	4	38	27.4	3,010	89	73.0	499	0.42	55.0	>2,084	<0.75
Malacca	4	23	17.5	3,300	84	71.0	556	0.77	25.0	2,164	0.8
Perak	8	44	29.9	2,373	62.2	62.2	392	1.1	24.0	1,900	<0.6
Kedah	4	19	16.6	2,650	59	59.0	470	0.50	19.0	8,532	<0.56

Location	Ribo-flavin mg	Niacin mg	Vitamin C mg	Vitamin B_6 mg	Folic Acid mg	NaCl gm
Kelantan 2/	1.2	20.0	20.0	0.7	0.5	2.0
Pahang	0.9	18.1	20.0	1.3	0.13	5.8
Johore	0.8	25.0	9.0	1.0	0.4	3.6
Malacca	0.85	25.1	11.5	1.3	0.7	8.0
Perak	0.6	11.1	12.3	0.89	0.51	6.7
Kedah	0.45	15.0	20.5	0.8	0.7	3.0

1/ Children less than one year of age are not included in these calculations.
2/ A sample from one family in this location contained buffalo liver.

TABLE 86. CALCULATED NUTRIENT INTAKE OF 25 CIVILIAN MALAY FAMILIES PER STANDARD MAN PER DAY
(Recipe Method)

Location	No. Families	No. Persons	Standard Man Per Location[1]	Calories	Protein gm	Fat gm	Carbo-hydrate gm	Calcium gm	Iron mg	Vitamin A IU	Thia-mine mg
Kelantan[2]	2	9	6.15	2,016	48	32	384	0.06	6.0	670	0.63
Pahang	3	23	15.4	3,197	100	94	490	0.4	14.0	1,720	1.0
Johore	4	38	27.4	2,825	80	74	470	1.1	11.0	1,620	1.0
Malacca	4	23	17.5	2,888	88	60	515	1.4	12.4	2,600	1.15
Perak	8	44	29.9	3,140	69	95	458	0.7	8.8	1,700	1.4
Kedah	4	19	16.6	2,641	69	85	400	0.4	13.6	3,300	1.1

Location	Ribo-flavin mg	Niacin mg	Vitamin C mg
Kelantan[2]	1.4	12.0	22
Pahang	1.0	17.0	60
Johore	0.5	15.0	55
Malacca	0.6	16.8	40
Perak	0.9	15.4	43
Kedah	0.5	13.2	52

1/ Children less than one year of age are excluded from these calculations.
2/ One family in this location consumed buffalo liver during the study period.

TABLE 87. NUTRIENT INTAKE OF MALAY CIVILIAN FAMILIES PER STANDARD MAN PER DAY
(Questionnaire Method)

Location	Calories	Protein gm	Fat gm	Carbo- hydrate gm	Calcium gm	Iron mg	Vitamin A IU	Thia- mine mg	Ribo- flavin mg	Niacin mg	Vitamin C mg
Kelantan	1,900	56	36	340	0.19	6.0	850	0.34	0.53	6.8	26
Pahang	2,051	49	55	340	0.25	4.1	1,100	0.6	0.4	9.0	30
Johore	2,700	60	57	482	0.23	9.0	754	0.5	1.0	8.7	40
Malacca	2,176	59	50	370	0.14	9.0	907	0.8	1.3	9.0	31
Selangor	2,150	67	53	314	0.20	6.0	2,087	0.92	0.67	19.8	58
Perak	2,000	63	45	335	0.25	5.5	1,015	0.30	0.6	7.1	50
Kedah	2,000	57	60	308	0.31	8.5	2,000	0.81	0.83	10.0	58

the Recommended National Allowance for Malaya. From the food sources of protein listed in Appendix Table 68 it appears that approximately 33 percent of the average protein intake comes from animal sources (fish).

Fat

According to the results of the survey, fats contribute approximately 25 percent of the total Calorie intake in Malaya (Table 43), principally from coconut oil and coconut emulsion.

Margarine is seldom eaten by the kampong folk, probably because of difficulties in keeping it. The families of the military dependents, however, consume more margarine.

Pork and peanut or groundnut oil contribute to the fat intake of the Chinese.

The wide variation in the kinds of fish consumed daily in this country as well as the variability in the fat content of the different species of fish (from mackerel classified as an oily species with a fat content ranging from 6 to 20 percent and prawns and cockles in the intermediate range of 2 to 6 percent to mullet, perch and whiting in the less than 2 percent range, all of which are part of the Malay diet) make it difficult to state the contribution that this food item makes to dietary fat.

The fat content of the raw and the cooked food composites was essentially similar in value, with one or two exceptions. The methods of cooking with fat enable the fat to be absorbed by the food to a great extent. One would not anticipate an appreciable loss in the fat content of the dietary through Malay methods of cooking.

Carbohydrate

Rice, sugar and products made in the home from white wheat flour provide the greater part of the dietary carbohydrate. Carbohydrate contributes approximately 60 to 65 percent of the diet Calories (see Table 43). The higher values for carbohydrate as measured in the cooked food composite analysis compared with the raw composite may be accounted for by the fact that sugar was omitted from the raw sample.

Other carbohydrate foods such as sago and sweet potatoes (ubi keledek) are also consumed but are not staple items to the extent that the above 3 items are.

Vitamins

Thiamine. Intakes of thiamine were "low" by the ICNND reference guide according to the food composite analysis method (see Tables 84 and 85). When the intake for thiamine is reported as milligrams per 1,000 Calories the values are again low. The kind of rice commonly used in Malaya and the lack of pulses in the diet may contribute to the low intake of thiamine. The biochemical data support the finding of a low intake of dietary thiamine. Low intakes have been noted in previous studies.

Riboflavin. Riboflavin intake by all three methods used is "low" in most instances according to the ICNND reference guide (Appendix Table 30). Findings were similar in the military dependent population. The low intake is related to the absence of milk and meat in the diet of the Malay civilian population. Similar results were obtained in earlier studies.

Niacin. Niacin intake varies by the three methods used for its determination. The questionnaire method presents results that are mainly in the "low" range for the ICNND reference guide while the other two methods present results in the "acceptable" and "high" ranges. With adequate protein in the diet in most instances the niacin values would be expected to be adequate, as has been found in earlier studies.

Vitamin A. Vitamin A values appear to be low in most instances by all three methods used, confirming earlier findings, with the recipe and the questionnaire method giving the lowest values. In some cases the vitamin A values fall in the "deficient" range according to the ICNND reference guide. The higher value found by chemical analysis is due to the fact that the composite sample contained food items that are good sources of this nutrient. However, some dietaries within the country contain inadequate amounts of vitamin A precursors even though red and green chilli peppers and dark green leafy vegetables are consumed as part of the general diet.

Vitamin C. The intake of vitamin C is lowest as determined by the chemical analysis of the raw food sample (Table 85). All values are in the "low" range by this method. The values obtained by the other two methods are adequate for the most part. The lower values found by analysis are believed to be due to destruction of the ascorbic acid in the food composite samples.

Minerals

Calcium. The intake of calcium is lowest as determined by the questionnaire method. In the cooked food composite analysis two of the 6 locations had "low" values according to the ICNND reference guide. Kelantan, which is "low" by all three methods, had little or no dietary source of calcium at the time of the visit. The small fish, ikan bilis, a major although small component of the diet which appears in many dishes, are totally consumed. In those dietaries where evaporated, condensed, or powdered whole milk was included, these foods make some contribution to the calcium intake. It is believed that, with the exception of some small children, calcium intakes are usually adequate because of consumption of both fresh and dried fish.

Iron. Both chemical analysis and the recipe method indicate a high level of iron in most diets. The questionnaire values indicate both "low" and "adequate" ranges. Iron intakes have been found to be higher by chemical analysis than by calculation in a number of earlier ICNND studies. The higher iron content by chemical analysis can in part be attributed to contributions from cooking utensils. The intake of iron is probably adequate.

Sodium. The sodium intake values in this report are for that part of the population sample that was included in the home dietary study only. Increased amounts of sodium chloride in Table 84 (cooked food analysis) compared with Table 85 (raw food analysis) represent salt that was added during cooking. Neither the salt nor the soy sauce used during cooking was weighed.

Dietary Study of School Children

A dietary study of school children was carried out by the questionnaire method in 7 states of Malaya during the survey. The nutritionist was assisted by an interpreter, usually a teacher, in obtaining the information. The breakdown of this sample by age, race and location is given in Table 88. Food intake data obtained (see Appendix Table 70) by this method were evaluated using the Recommended Daily Dietary Allowances for Malaya (IMR Report No. 64; see Appendix Table 37) and are presented in Table 89.

TABLE 88. COMPOSITION OF SAMPLE OF SCHOOL CHILDREN STUDIED, MALAYA

Location	Total No. Interviewed	Race			Age (years)			
		Malay	Chinese	Tamil	6-9	10-12	13-15	16-20
Kelantan	20	5	15	--	--	10	10	--
Pahang	15	5	10	--	--	4	11	--
Johore	79	20	48	11	2	40	37	--
Malacca	27	27	--	--	--	14	13	--
Selangor	116	55	--	61	27	25	64	--
Kedah	50	36	10	4	--	12	20	18[1/]
Perak	65	--	65	--	13	51	1	--
Total	372	148	148	76	42	156	156	18

1/ This was the state where secondary school pupils were interviewed.

The sample of school children included the 3 races, Tamil, Chinese and Malay. Although a greater percent of the group was primary school children, two secondary schools were included in the study.

The school day in Malaya is conducted in two sessions. One group of children attends class from 7:00 am to 1:00 pm and a second group attends the afternoon session. A recess period during both sessions and at the noon hour usually finds a traveling salesman near the school selling a variety of foods, such as sugar cane water, groundnuts, nasi pulot, ice kachang, goreng pisang, fried rice and tosai, to the children. Some children buy their breakfast at midmorning recess. Fairly accurate results may be obtained from school children by use of a questionnaire.

Food Consumption

Comparing the nutrient intake with the recommended allowances for Malaya for children in age groups 6 to 15 years it appears that all nutrients including Calories are below the recommended levels (Table 89). It should be noted that these values represent actual intakes and have not been converted to "Standard Man" values by age, which would have brought them closer to the recommended levels.

TABLE 89. NUTRIENT INTAKE OF SCHOOL CHILDREN INTERVIEWED BY QUESTIONNAIRE METHOD, MALAYA 1/

Location	Calories	Protein gm	Fat gm	Calcium gm	Iron mg	Vitamin A IU	Thiamine mg	Riboflavin mg	Niacin mg	Vitamin C mg
Kelantan	1,218	35	42	0.10	4.5	560	0.5	0.24	6.9	27
Pahang	1,450	27	42	0.08	3.7	672	0.58	0.76	7.7	30
Johore	1,214	37	30	0.13	6.1	400	0.7	0.36	7.7	28
Malacca	1,155	30	27	0.08	3.3	800	0.4	0.19	6.8	30
Selangor	1,260	35	20	0.25	5.5	235	0.45	0.2	6.2	15
Perak	1,450	45	45	0.11	4.5	580	0.75	0.7	8.0	30
Kedah	1,410	36	45	0.15	5.9	551	0.5	0.48	8.9	27

1/ This table does not represent values on a Standard Man basis.

In every location it was found that some children had had no meal at home prior to coming to school in the morning. The home dietary studies verified this fact, and revealed that others might have had bread and tea or coffee with sugar before leaving for school. Those children who attended afternoon sessions all received a noon meal before going to school.

The size of this sample is small, but the results bear out previous impressions of the Malayan survey team members that the diets of school childred are generally unsatisfactory.

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IX

CORRELATIVE DISCUSSIONS

As in other surveys there is a disappointing lack of correlation between physical findings and laboratory determinations. There are, however, certain areas in which correlations are customarily sought.

Military

1. Riboflavin versus angular lesions

As anticipated there is only a suggestion of correlation between the occurrence of angular lesions or angular scars, which presumably may indicate a previous period of riboflavin deficiency, and the rate of urinary excretion of riboflavin at the time of examination. There was a considerable group of the military whose rate of excretion of riboflavin fell into the "deficient" or "low" category. The accompanying table, which at first glance seems to show a correlation between these two, does not necessarily do so (Table 90). On closer inspection one can see that angular scars may well have existed for a considerable period of time and consequently may be unrelated to the level of riboflavin excretion at the time of the examination. On the other hand, people who customarily ate a diet deficient in riboflavin might be expected to continue to do so.

TABLE 90. URINARY RIBOFLAVIN EXCRETION LEVELS VERSUS PREVALENCE OF ANGULAR SCARS, MILITARY, MALAYA

Riboflavin excretion µg/gm creatinine	Number	Subjects with Angular Scars	
		No.	Percent
<27	50	4	8.0
27-79	48	1	2.1
80-269	16	--	0
270+	4	--	0
Total	118	5	4.2

2. Correlation between mean corpuscular hemoglobin concentration and filiform papillary atrophy of the tongue

There was no significant correlation between these parameters.

3. Correlation between thiamine excretion in the urine and bilateral loss of deep tendon reflexes (ankle jerks)

It is well known that once ankle jerks are lost as a result of thiamine deficiency they seldom return. Only three of the subjects examined in the military group were found to have absent ankle jerks and hence no correlation can be drawn. Nonetheless, a significant number of the military had rather low rates of excretion of thiamine in the urine.

4. Ascorbic acid in the blood as compared with lesions of the gums

Many factors other than vitamins can influence the health of the gums including lack of dental hygiene, the texture of the food eaten and the condition of the teeth. In this survey there was no correlation between the concentration of vitamin C in the blood and the presence or absence of swollen red papillae. Although there was a questionable trend it is not of statistical significance. There was also rather marked disparity between the examiners' observations (see Appendix Table 24).

Civilians and Dependents

1. Riboflavin versus angular lesions

There was no significant correlation in this group.

2. Mean corpuscular hemoglobin concentration as compared with filiform papillary atrophy of the tongue

In the children (Table 91) there was a real relationship between these two findings. In adults, however, this was not so marked and although suggestive it did not reach a statistically significant level. It may be noted here that adults had significantly lower values for all of the hemoglobin indices as their age increased (see Appendix Table 45).

TABLE 91. MEAN CORPUSCULAR HEMOGLOBIN CONCENTRATIONS VERSUS FILIFORM PAPILLARY ATROPHY OF THE TONGUE IN CHILDREN 5-14 YEARS, MALAYA

Mean corpuscular hemoglobin concentration	Number		Subjects with Filiform Papillary Atrophy No.		Percent
19	1				
21	2				
22	1				
23	1				
24	2	12	1		8.3
25	3				
26	1				
27	1				
28	4	9	2	3	33.3
29	5		1		
30+	237		4		1.7
Total	258		8		3.1

3. Thiamine versus loss of tendon reflexes

Although there was no correlation it is apparent that a majority of those persons who lacked ankle jerks were in the age group past 45 years. This would suggest that a number of these people had had clinical or subclinical beriberi during the Japanese occupation and never recovered their tendon reflexes.

4. Ascorbic acid in the blood versus gum lesions

No significant correlation was found.

5. Goiter and iodine excretion

As in other surveys the prevalence of goiter seems to vary directly with the amount of fluorine in the water and indirectly with the prevalence of dental caries. In Malaya, goiter was found relatively uncommonly as compared with neighboring Southeast Asian countries, particularly Thailand and Burma. As one would anticipate, goiter was most frequent in women, particularly during the reproductive years, but there did not seem to be any correlation between the findings of goiter and the quantity of iodine excreted in the urine. It should be noted, however, that more than half of the patients examined excreted less than 50 µg of iodine per gram of creatinine in the urine, a figure which falls in the low range. Iodine excretion was highest in the military groups in Malacca, but there was no obvious difference between the amount of fish in the diets of these military groups as compared with those of the civilian and dependent groups. Similarly, one could not see that the rate of iodine excretion was any greater in coastal communities than it was in inland villages.

6. Anemia

Anemia, although not a serious problem, in Malaya, does occur with some regularity. It is interesting to find that although parasitic infestation including hookworm was rather widespread, there was no correlation between these two findings.

7. Cholesterol

In Table 92 the cholesterol concentration of nonpregnant, nonlactating women as compared with pregnant or lactating women in Malaya showed very little difference. This is in contrast to Western countries where blood lipid values

TABLE 92. CHOLESTEROL LEVELS IN NONPREGNANT, NONLACTATING WOMEN VERSUS PREGNANT OR LACTATING WOMEN IN MALAYA

	Nonpregnant, nonlactating					Pregnant	Lactating
Age (years)	5-9	10-14	15-44	45+	Total		
Number	56	69	111	24	260	8	25
Cholesterol mg/100 ml	175	180	202	209	191	208	191
	Percent Distribution						
70-99	--	--	--	4.2	0.4	--	--
100-149	19.6	21.7	9.9	--	14.2	25.0	16.0
150-199	58.9	58.0	45.0	29.2	50.0	37.5	48.0
≥200	21.4	20.3	45.0	66.7	35.4	37.5	36.0

rise remarkably during pregnancy. It is also of interest to note that the concentration of cholesterol in the serum of men does not show a progressive rise with age as it does in Western countries (Appendix Table 45) and that the cholesterol values are slightly higher in women that they are in men of similar age groups. This again is at variance with observations in Western countries. In general, the values for lipid phosphorus and β-lipoprotein paralleled those for cholesterol.

Perhaps the best correlation between physical examination and over-all nutrition lies in the height and weight figures (see Figures 12-17), which indicate that the people of Malaya are relatively better nourished than those in most other Southeast Asian countries and yet their height and weight are not equal to values which have been used as standards for Western countries. It may be argued that genetic or hereditary factors result in these differences but in most countries studied these differences in size tend to disappear when nutritional intake during the growing years becomes equalized.

X

SPECIAL STUDIES

Two groups of investigators accompanied the survey team in order to conduct special studies. The first of these was a study of the prevalence, severity and clinical nature of diabetes mellitus especially as it would correlate with lipid metabolism and the occurrence of ischemic heart disease. In this study conducted by Dr. John Kalbfleisch and his group, subjects in both the military and civilian populations were studied for diabetes and heart disease. Most of these were over the age of 35 years. All subjects had fasted for at least 2 hours before they were given a test dose of glucose. A sample of venous blood was collected before the administration of glucose (1 gm per kilogram of body weight) and 2 hours later a sample of blood and a sample of urine were collected. Urinary glucose was determined by Clinistix and blood glucose by use of the Autotechnicon (1). Cholesterol was determined by a micro method (2).

Cardiologic evaluation consisted of a history, a physical examination and an electrocardiogram. Electrocardiograms were of two types, a screening lead and a standard 12-lead tracing.

It was found that subjects who were diabetic or had slightly abnormal carbohydrate tolerancé had higher cholesterol values than normal individuals. The same subjects also had a higher prevalence of hypertension, history of chest pain, and electrocardiographic abnormalities. As expected, it was found that diastolic blood pressure and cholesterol concentration tended to increase with rise in body weight.

Blood pressure determinations in the military groups have been discussed in another section of this report. Only one patient was classified as having hypertensive cardiovascular disease while 4 1/2 percent had possible hypertensive heart disease. Suggestive left ventricular hypertrophy was observed in the electrocardiographic tracings of 10.8 percent. Three individuals had abnormal electrocardiograms suggestive of coronary heart disease.

Three naval personnel from NAMRU-2(Naval Medical Research Unit No. 2) accompanied the team throughout the survey and collected specimens of feces and blood for parasitologic examination. They obtained specimens from all of the 33 examining sites where the team worked. This survey included 1,983 stool specimens, 1,280 diurnal blood films and 627 matched diurnal-nocturnal blood films for malaria and microfilaria. The results of the intestinal parasitic studies were based upon examination of a single specimen and hence the prevalence of infestation might well be considerably higher. It was noted that the prevalence of infestation was lower in the military than in the civilian groups. In general, men had a higher rate of infestation than women and the younger age groups were the highest of all, particularly the groups aged 5-9 and 10-14.

Only 1.8 percent of males and 5.9 percent of females were entirely free of parasites. The prevalence of intestinal parasites in female military dependents was 88.3 percent for Trichuris, 66.7 percent for Ascaris, 45.7 percent for hookworm, and 4.2 percent for Endameba histolytica. By location it was noted that Malacca had the highest infestation with hookworm and Johore had the lowest. The rate of infestation with Endameba histolytica in military men was 12.8 percent in Perak compared to only 2.9 percent in the average of

civilian men. There were other marked regional differences, but the frequency of infestation was high in all groups examined. The rural Malays had the highest Ascaris infestation rate with 75.9 percent, followed by the urban Indians with 73 percent and the rural Chinese and rural Indians with 54.5 percent. A comparison of the hematocrit and hemoglobin values with the presence or absence of hookworm infestation indicated that there were slightly lower hematologic values for those with infestation, but these differences were not statistically significant.

The results of these special studies are presented in detail below.

Diabetes and Heart Disease

Because of the evidence linking the occurrence of arteriosclerotic and hypertensive heart disease at least in part to dietary intake plus the known relationships of carbohydrate metabolism to diet and body composition, studies to determine the prevalence of diabetes mellitus, arteriosclerotic and hypertensive heart disease were carried out as an integral part of the nutrition survey of Malaya. These studies make possible comparisons with other populations having different dietary habits, in which similar data have been or will be accumulated using the same technics.

Methods

As much as possible, subjects for testing were selected at random from the civilian and military groups studied in the survey. At times, however, it was apparent that concern about the blood drawing procedure reduced the number willing to serve as subjects, and it was then necessary to work in a kampong or location different from that of the nutrition survey. For diabetes studies only a few subjects under 35 years of age were included except in a small military group which had a substantial proportion of younger subjects. All pregnant and lactating women were excluded. Only those subjects who were fasting at least two hours and who could return two hours following the ingestion of glucose were examined. Known diabetics were not excluded.

A brief history was taken regarding the presence or absence of diabetes in the subjects and their families and the birth weights of the children of those subjects being tested. They were also questioned about previous heart diseases, angina pectoris and hypertension. Each subject was examined for cardiovascular abnormalities. All findings were recorded on the form shown in Table 93.

After a fasting urine and venous blood specimen were obtained, each subject was given a glucose solution to drink in the amount of one gram per kilogram of body weight. Two hours following the ingestion of glucose, the second urine and blood specimens were obtained. Some subjects refused to permit blood drawing, while practically all objected to having blood taken twice. Accordingly, taking of the initial blood specimen was omitted from the procedure shortly after the start of the study.

Urine specimens were screened for glucose by Clinistix determinations.[1/] "True" blood glucose values were obtained using the autoanalyzer (Technicon),

1/ Clinistix, an enzyme test of urine sugar utilizing reagent strips, manufactured by the Ames Company, Inc., Elkhart, Indiana.

TABLE 93. DIABETES AND HEART HISTORY FORM

No. ____________ Name:
Date: ____________ Age: ________ Sex: _________ Race: __________
Location: ____________ Ht: _______ Wt: ________ % "Std. Wt": ________

Diabetes

Personal
- Duration
- Treatment
  - Diet - Insulin - Oral Agents
  - Taken Today

Family History
- Sibling
- Parent
- Child
- Other

Obstetric
- Para
- Gravida
- Baby over 4 kg
  - Wt.
  - No.

1. Hours fasting? ____________________
2. Glucose at ____________________
3. 2 hr blood sugar at ______________
4. First urine sample - Negative 1+ 2+ 3+
5. Second urine sample - Negative 1+ 2+ 3+
6. First blood sugar -
7. Second blood sugar -
8. ECG -
9. Cholesterol -
10. Skinfold measurements ____________
11. Blood Pressure ____________________
12. Heart Examination _________________
13. Comments __________________________

Heart

Rh Fever

High Blood Pressure

Angina Pectoris

Infarction — On exertion / At rest

Digitalis

Dyspnea

Edema

Arrhythmia

Other

COL.																	
CODE																	
COL.																	
CODE																	

which employs a principle described by Hoffman (1). The reproducibility of this method was good, as the standard error of estimate based on 58 duplicate pairs of samples was 3.5 mg per 100 ml. Plasma cholesterol was determined by the micromethod of Carpenter, Gotsis and Hegsted (2).

Most of the subjects examined for diabetes also had a single, oblique chest lead electrocardiogram (ECG) performed for screening purposes. In addition, standard 12-lead ECG's were obtained on 74 subjects in order to calculate sensitivity and specificity of the single, screening lead ECG. A single screening lead ECG was recorded for a further group of subjects selected at random from the regular survey sample.

Both the screening and standard 12-lead ECG's were read independently by two cardiologists. Criteria for interpretation of the screening ECG were those originally described by Lindeman et al. (3). Discrepancies between interpretations were resolved by mutual agreement after reviewing all those ECG's about which there was a difference of opinion. Comparison of the 74 standard 12-lead ECG's with the single, screening lead ECG's indicated a sensitivity of 90 percent for the single lead in detecting abnormalities, which is comparable to the initial experience with this lead (3).

In the diabetes survey, the two-hour blood glucose values were divided into three groups:

1. Diabetic: Two-hour blood glucose value more than 100 (mg/100 ml) plus age in years of the subject. (For example, a 60-year old subject was not considered to be diabetic unless the blood glucose exceeded 160 mg per 100 ml, whereas in subjects 35 years of age, values of 135 mg per 100 ml or greater were considered diabetic.)

2. Borderline: Two-hour blood glucose value more than 120 mg per 100 ml, but not "diabetic" as defined above.

3. Normal: Two-hour blood glucose value less than 120 mg per 100 ml.

The criteria upon which this arbitrary classification is based are somewhat more conservative than those proposed by others (4) which do not take into account the "normal" decrease in tolerance associated with aging (5, 6, 7). These more conservative criteria also take into account the substantial intra-individual variability inherent in oral glucose tolerance tests (7-9). For example, the data of Unger (8) and those of West and co-workers (7) show that day to day variations of the two-hour glucose tolerance test ranging from 20 to 30 mg per 100 ml are not at all uncommon. Thus a subject with a two-hour blood glucose level of 140 mg per 100 ml may exhibit a level lower than 110 mg per 100 ml or higher than 170 mg per 100 ml upon being tested again.

Results

Diabetes Mellitus

The findings by location are summarized in Table 94, and by age, race and sex in Tables 95 and 96. Although more than 700 were tested, several

TABLE 94. SUMMARY OF DIABETES SURVEY FINDINGS BY LOCATION, MALAYA

Location	Malay	Chinese	Indian	Total	Diabetics	Borderline tolerance
			Numbers tested			
Selangor	33	7	126	166	6	9
Kelantan	53	0	0	53	1	3
Pahang	21	1	0	22	0	0
Johore	26	47	15	88	6	4
Malacca	93	2	0	95	1	4
Perak	1	68	2	71	2	6
Kedah	71	0	0	71	1	5
Total	290	128	148	566	17	31
Military Battalions A, B and C, RMR1/	45	0	0	45	0	0

1/ RMR = Royal Malay Regiment.

subjects failed to return for two-hour tests and several containers of blood specimens were lost or broken, leaving a total of 566 civilian and 45 military subjects for whom results were available for final analysis. Over all, in the civilian groups, 8 previously unknown diabetics were found for a new case prevalence of 1.4 percent. There were 9 (1.6 percent) previously known and confirmed diabetics for a total of 17 cases, a prevalence of 3 percent. The expected prevalence in the United States would approximate 4 percent for the same age group (10). However, the results from the United States are based on less sensitive technics. The criteria for diagnosis were somewhat more liberal in the United States study, but the subjects in that survey were not given glucose tolerance tests except when less sensitive screening tests were positive. It is estimated that the apparent prevalence of diabetes in American subjects over 35 years of age would approximate 6 percent if all subjects had been given a glucose tolerance test similar to that employed in Malaya.

The prevalence rate of diabetes among the ethnic subgroups was: Malays 1.7 percent, Indians 4.1 percent and Chinese 4.7 percent. In all three races, the prevalence in males was greater than the prevalence in females, and, over all, the prevalence rate for males of 3.9 percent was more than double the rate of 1.7 percent found for females. This finding is in contrast to the preponderance of female diabetics in the United States, the United Kingdom, Uruguay and other countries, but is consistent with the observations of Pillay and Hin at the General Hospital in Taiping (11) and those of Yuen at the Singapore General Hospital Diabetic Clinic (12). The latter study also found a high incidence of Indians in the diabetic clinic population despite the predominantly Chinese population of Singapore.

The prevalence rate of diabetes increased with age for both sexes to a maximum of 9.2 percent in the group of males 65 years of age and older even though criteria for diagnoses were more conservative for older subjects (see above).

TABLE 95. SUMMARY OF CIVILIAN DIABETES SURVEY BY RACE AND SEX, MALAYA

Race and Sex	Number tested	Diabetics New	Diabetics Known	Diabetics Total	Diabetics Percent	Borderline Number	Borderline Percent
Malay							
Males	153	2	2	4	(2.6)	3	(2.0)
Females	137	1	0	1	(0.7)	10	(7.3)
Total	290	3	2	5	(1.7)	13	(4.5)
Chinese							
Males	60	2	2	4	(6.8)	6	(10.2)
Females	68	2	0	2	(2.9)	4	(5.9)
Total	128	4	2	6	(4.7)	10	(7.8)
Indian							
Males	121	0	5	5	(4.1)	6	(5.1)
Females	27	1	0	1	(3.7)	2	(7.7)
Total	148	1	5	6	(4.1)	8	(5.4)
Grand total	566	8	9	17	(3.0)	31	(5.5)

An additional 5.4 percent of the subjects was classified as having "borderline" carbohydrate tolerance, and there was a similar increase in the prevalence of this result with age. The prevalence of borderline abnormalities was greatest in Chinese males, but was greater in both Malay and Indian females than in Malay and Indian males.

A higher prevalence of diabetes was found in Johore, but here a predominantly Chinese population was studied. Likewise, a higher prevalence was found in Selangor, but this may be attributable to the fact that almost half this sample comprised older Indian subjects. These data are suggestive that urban populations have a higher prevalence than do the rural areas, but they are not conclusive because the rural sample was much larger than the urban groups studied.

TABLE 96. SUMMARY OF CIVILIAN DIABETES SURVEY BY AGE AND SEX, MALAYA

Age (years)	Males 30-34	Males 35-44	Males 45-54	Males 55-64	Males 65+	Males Total	Females 30-34	Females 35-44	Females 45-54	Females 55-64	Females 65+	Females Total
Number tested	13	86	87	83	65	334	11	85	77	37	22	232
Diabetic	0	1	2	4	6	13	0	0	2	1	1	4
Percent	(0)	(1.2)	(2.3)	(4.8)	(9.2)	(3.9)	(0)	(0)	(2.6)	(2.7)	(4.5)	(1.7)
Borderline	0	0	6	4	5	15	0	2	7	3	4	16
Percent	(0)	(0)	(6.9)	(4.8)	(7.7)	(4.5)	(0)	(2.4)	(9.1)	(8.1)	(18.1)	(6.9)

Not unexpectedly, no cases of diabetes were found in the small military sample since this is a rather selected population on the basis of age, sex and minimal physical requirements for enlistment. Also this group was principally composed of Malay subjects.

There was a distinct paucity of subjects who had a history of diabetes occurring in a close relative (child, sibling, or parent). In only three instances was such a history obtained. This probably reflects a number of factors such as earlier mortality, and ignorance of the subjects and their relatives concerning the disease. Only three females gave a history of giving birth to babies weighing over four kilograms. This low incidence of large babies can be explained partially by lack of knowledge of birth weights, but is probably attributable to the generally lower birth weights of these ethnic groups as compared to those of Western countries. In 13 subjects who gave a personal history of diabetes, the diagnosis was confirmed in 9 on the basis of the criteria used in this study while two had borderline tolerance. The other two subjects classified by our criteria as normal also may initially have had borderline carbohydrate tolerance interpreted as abnormal by other criteria.

Urine and blood glucose data are compared in Table 97 and indicate that these random or fasting urine specimens identified only 10 of the 17 diabetics (59 percent). On the other hand, the two-hour urine specimens identified 15 of 17, or 88 percent of the diabetics. However, only 25 percent (15 of 59) of those with positive two-hour urine tests were found to have diabetes, while 10 of 25, or 40 percent of the individuals with positive tests of random or fasting urine, were confirmed as diabetics. The two-hour urine is thus more sensitive but less specific than the fasting or random urine specimens. A previous experience (13) indicated that blood tests 2 to 4 hours after meals failed to identify about 25 percent of the diabetics when populations over 35 years of age were studied. Since, however, it is frequently not feasible to utilize the glucose tolerance test for large-scale surveys, the urine and post-prandial blood glucose levels remain the most practical screening procedures available even though they are less accurate diagnostic indices.

TABLE 97. COMPARISON OF TWO-HOUR BLOOD AND URINE GLUCOSE LEVELS, MALAYA

Two-hour blood glucose mg/100 ml	Clinistix urine reaction Negative	1+	2+	3+	Total	Total positive	Percent positive
	Number of subjects						
<100	423	14	9	2	448	25	6
100-139	79	11	4	1	95	16	17
140-179	5	5	0	0	10	5	50
180+	0	2	4	7	13	13	100
Total	507	32	17	10	566	59	10
Diabetic	2	4	4	7	17	15	88
Borderline	21	9	1	0	31	10	32

Table 98 indicates an increase in the prevalence of diabetes among subjects whose weights are greater than average. Six percent of the subjects exceeding 100 percent of "standard weight" had diabetes while only 2.3 percent of those subjects below 100 percent "standard weight" had diabetes. This difference could not be attributed to an increase of weight with age because more younger subjects exceeded 100 percent of "standard weight" than did older ones.

TABLE 98. COMPARISON OF TWO-HOUR BLOOD GLUCOSE LEVELS AND PERCENT OF "STANDARD WEIGHT," MALAYA

Percent "Standard Weight"	<70	70-79	80-89	90-99	100-109	110+
Two-hour blood glucose mg/100 ml			Number of subjects			
<100	32	82	114	87	51	48
100-139	8	11	29	14	14	11
140-179	0	2	0	3	3	2
180+	0	1	5	2	2	3
Total	40	96	148	106	70	64
Mean blood glucose level	85.9	86.7	91.2	87.5	92.4	101.6
Diabetic	0	2	5	2	4	4
Percent	(0)	(2.1)	(3.4)	(1.9)	(5.7)	(6.2)
Borderline	3	4	7	8	5	2
Percent	(7.5)	(4.2)	(4.7)	(7.5)	(7.1)	(3.1)

Those subjects classified as naving diabetes and females with borderline carbohydrate tolerance also had slightly higher mean plasma cholesterol levels than those with normal carbohydrate tolerance as shown in Table 99. This slight difference, however, was not statistically significant. Only 28 percent of the cholesterol values for males, and 35 percent for females were in excess of 200 mg per 100 ml. There were no significant racial differences, although the small group of Indian females tended to have the highest values (Table 100). There was no apparent relation of cholesterol levels to age groups (Table 101), but a rise of mean cholesterol levels occurred with increasing percent of "standard weight," particularly in males (Table 102).

TABLE 99. COMPARISON OF PLASMA CHOLESTEROL AND BLOOD GLUCOSE VALUES, MALAYA

Plasma cholesterol mg/100 ml	Blood Glucose (mg/100 ml) <60	60-79	80-99	100-119	Borderline	Diabetic	Total
				Number of subjects			
				Males			
Total no.	26	103	89	29	11	12	270
Mean	200	174	179	189	158	194	180
<150	3	34	26	9	4	2	78
150-199	13	44	39	7	6	5	114
200-249	6	18	20	8	1	4	57
250+	4	7	4	5	0	1	21
				Females			
Total no.	13	66	60	33	13	4	189
Mean	160	195	182	177	194	237	187
<150	5	11	12	9	1	0	38
150-199	7	28	26	17	6	0	84
200-249	1	19	20	5	4	3	52
250+	0	8	2	2	2	1	15

Racial dietary differences in intakes of fat and carbohydrate were not outstanding (pp. 101 and 149). The relatively low incidence of diabetes occurring in racial groups consuming a high-carbohydrate, low-animal fat diet is interesting but has to be viewed relative to other genetic and environmental factors.

Pillay and Hin (11), basing their conclusions on urine screening tests of 2,772 hospital outpatients with subsequent glucose tolerance tests on those with positive urines, estimated the prevalence of diabetes in Malaya to be 0.65 percent. They thought the actual incidence, however, would be somewhat lower because hospital outpatients did not represent a truly random group of subjects. It should be recalled that the fasting or random urine glucose test utilized in our study identified only 59 percent of those with diabetes. Hence, if all the subjects in the study of Pillay and Hin had received glucose loading tests, the incidence would probably have been more than one percent. The results of the present study suggest the over-all prevalence of diabetes in Malaya is slightly less than 1.5 percent. This assumption takes into account the rare occurrence of diabetes in subjects less than 30 years of age and the population distribution by age. Accordingly, there would appear to be approximately 105,000 adult diabetics in Malaya of which nearly half are unknown. By ethnic groups, there are approximately 60,000 Chinese, 30,000 Malays and 15,000 Indians with diabetes.

Hypertensive Heart Disease

The blood pressure levels and prevalence of "hypertension" in the general survey are discussed in the section on clinical findings and shown in Table 49, p. 126. The blood pressure levels and prevalence of "hypertension" in the

TABLE 100. PLASMA CHOLESTEROL LEVELS BY SEX AND RACE, MALAYA

Sex	Males				Females			
Race	Malay	Chinese	Indian	Total	Malay	Chinese	Indian	Total
Plasma cholesterol mg/100 ml	Number of subjects							
Total no.	121	44	106	271	108	61	21	190
Mean	182	184	176	180	188	182	194	187
S.E.1/	4	8	5	3	4	5	9	3
66-149	26	10	42	78	24	13	1	38
150-199	61	23	31	115	45	27	13	85
200-249	26	9	22	57	29	18	5	52
≥250	8	2	11	21	10	3	2	15

1/ S.E. = standard error.

TABLE 101. PLASMA CHOLESTEROL LEVELS BY SEX AND AGE, MALAYA

Age	<15	15-24	25-34	35-44	45-54	55-64	65+	Total
Plasma cholesterol mg/100 ml	Number of subjects							
	Males							
Total no.	--	--	13	72	66	64	56	271
Mean			206	199	191	160	160	180
S.E.1/			±8	±6	±8	±5	±5	±3
66-149			1	11	13	29	24	78
150-199			5	29	30	25	26	115
200-249			6	23	14	8	6	57
≥250			1	9	9	2	--	21
	Females							
Total no.	--	--	10	65	66	29	20	190
Mean			160	187	190	190	185	187
S.E.			±12	±5	±6	±8	±10	±3
66-149			2	11	15	5	5	38
150-199			8	35	23	10	9	85
200-249			--	14	20	13	5	52
≥250			--	5	8	1	1	15

1/ S.E. = standard error.

TABLE 102. PLASMA CHOLESTEROL LEVELS BY PERCENT "STANDARD WEIGHT," MALAYA

Percent "standard weight"	<70	70-79	80-89	90-99	100-109	≥110	Unknown	Total
Plasma cholesterol mg/100 ml				Number of subjects				
				Males				
Number	30	97	129	88	51	31	33	459
Mean	147	156	172	191	210	221	162	180
S.E.1/		±4	±5	±7	±11	±12		±3
				Females				
Number	22	50	118	107	68	64	43	472
Mean	187	192	181	184	197	199	175	187
S.E.		±7	±7	±6	±7	±10		±3

1/ S.E. = standard error.

group selected for electrocardiographic studies were not significantly different when compared with the general survey. Average systolic and diastolic blood pressure levels of 834 civilian subjects over 25 years old who had electrocardiograms available for comparison are given in Table 103. In general, all three ethnic groups, Malays, Chinese and Indians, had slightly lower mean blood pressure levels than those found in the United States study of Master et al. (14).

The prevalence of "hypertension" at three arbitrary blood pressure levels for the electrocardiographic study group is shown in Table 104. There was no significant difference in the prevalence of hypertension among the three races. The prevalence increased with age and was highest over the age of 65 in both sexes. The prevalence of hypertension was also slightly lower than that recorded by Master et al. in the United States study. Partially, this lower prevalence may be explained by differences in weight because, as shown in Table 105, there is a general rise of average systolic and diastolic blood pressure levels by percent of "standard weight" groups. The majority of Malay subjects were below "standard weight" as defined in the United States (15).

TABLE 103. AVERAGE BLOOD PRESSURE LEVELS BY AGE, RACE AND SEX, MALAYA COMPARED TO THE UNITED STATES[1/]

Age (years)	Males 25-34	35-44	45-54	55-64	65+	Total	Females 25-34	35-44	45-54	55-64	65+	Total
Malay												
No. subjects	6	53	47	46	17	169	53	58	57	23	10	201
Systolic, mm Hg	126	127	124	137	150	131	120	122	141	144	146	128
Diastolic, mm Hg	75	80	74	81	85	79	76	79	82	82	79	78
Chinese												
No. subjects	5	21	25	26	21	98	17	45	34	21	18	135
Systolic, mm Hg	132	132	130	136	146	135	118	120	136	139	164	132
Diastolic, mm Hg	75	83	80	80	79	80	77	76	82	81	82	79
Indian												
No. subjects	16	32	41	29	35	153	8	17	12	4	3	44
Systolic, mm Hg	119	135	138	138	138	134	123	130	133	118	151	128
Diastolic, mm Hg	75	86	85	81	77	80	75	83	86	81	89	81
Total Malaya												
No. subjects	27	107	113	107	76	430	79	133	109	50	33	404
Systolic, mm Hg	123	130	131	137	143	133	120	122	139	140	157	129
Diastolic, mm Hg	75	82	80	81	80	80	76	78	83	81	82	79
United States[1/]												
Systolic	126	128	132	140	--	--	118	126	134	141	--	--
Diastolic	78	81	83	84	--	--	74	79	82	84	--	--

1/ From the data of Master et al. (14).

TABLE 104. PERCENT PREVALENCE OF HYPERTENSION BY RACE, AGE AND SEX, MALAYA COMPARED TO THE UNITED STATES[1/]

Age (years)	Males 25-34	Males 35-44	Males 45-54	Males 55-64	Males 65+	Males Total	Females 25-34	Females 35-44	Females 45-54	Females 55-64	Females 65+	Females Total
United States[1/]						Percent Prevalence						
140/90[2/]	22	31	42	57	--	--	11	24	45	58	--	--
150/100[2/]	6	10	19	32	--	--	3	9	24	36	--	--
Diastolic >95	3	8	13	18	--	--	3	6	15	20	--	--
Malay												
No. subjects	6	53	47	46	17	169	53	58	57	23	10	201
						Percent Prevalence						
140/90[2/]	17	23	21	35	59	27	11	10	44	56	70	25
150/100[2/]	0	13	6	22	53	16	4	7	37	39	30	16
Diastolic >95	0	13	6	15	29	12	6	7	19	5	0	9
Chinese												
No. subjects	5	21	25	26	21	98	17	45	34	21	18	135
						Percent Prevalence						
140/90[2/]	40	38	24	38	62	40	12	16	23	48	61	27
150/100[2/]	0	14	16	27	43	23	6	9	12	29	61	19
Diastolic >95	0	29	12	11	14	15	6	7	9	10	28	10
Indian												
No. subjects	16	32	41	29	35	153	8	17	12	4	3	44
						Percent Prevalence						
140/90[2/]	0	37	39	38	34	32	12	18	33	25	67	22
150/100[2/]	0	25	22	31	29	23	0	12	17	0	67	12
Diastolic >95	0	25	27	7	14	16	0	6	25	0	0	8

1/ From the data of Master et al. (14).
2/ Blood pressure in mm Hg; either the systolic or diastolic reading or both are of stated value or higher.

TABLE 105. AVERAGE SYSTOLIC AND DIASTOLIC BLOOD PRESSURE LEVELS BY PERCENT OF "STANDARD WEIGHT" AND SEX, MALAYA

Percent "Standard Weight"	<70	70-79	80-89	90-99	100-109	110+	Total
				Males			
No. subjects	29	96	128	87	51	23	422
Systolic blood pressure mm Hg	131	129	128	139	137	148	133
Diastolic blood pressure mm Hg	76	78	76	81	83	93	80
				Females			
No. subjects	19	50	117	104	68	61	420
Systolic blood pressure mm Hg	133	128	125	127	132	134	129
Diastolic blood pressure mm Hg	74	77	76	78	81	84	79

Hypertensive heart disease was defined as hypertension in the presence of definite electrocardiographic evidence of left ventricular hypertrophy. The prevalence of hypertensive heart disease by age, sex and race for three blood pressure levels is given in Table 106. Indian males had the highest prevalence of hypertensive heart disease while Malay males and females had the lowest. The over-all prevalence of hypertensive heart disease in Malaya found in this study is from 0.6 percent to 1.6 percent depending upon the accepted blood pressure level. If roentgenographic studies for cardiomegaly had been utilized in this study, the prevalence of hypertensive heart disease would have been slightly higher. On the basis of a previous study (13), an additional 0.5 percent would have been found to have cardiomegaly by X-ray in the presence of hypertension. Hanam reviewed X-rays from a case-finding tuberculosis survey of all age groups in Singapore and found 10 percent of abnormal heart shadows on follow-up study were due to hypertensive heart disease (16). In Hanam's study hypertensive heart disease, rheumatic heart disease and congenital heart disease were nearly equal in prevalence.

An additional group of subjects with hypertension was classified as having possible hypertensive heart disease when there was suggestive electrocardiographic evidence of left ventricular hypertrophy or in the absence of hypertension when there was definite left ventricular hypertrophy by electrocardiogram. These results are shown in Table 107 and indicate an additional 3 to 4 percent of the study group may have hypertensive heart disease. Malay females showed the highest prevalence of possible hypertensive heart disease and Indian males were almost as high.

The prevalence of hypertensive heart disease in several studies in the United States varied from 3 to 8 percent for Caucasians and 11 percent for Negroes (17-19). None of these studies, however, was strictly comparable by age groups or methodology, but the present study suggests a lower prevalence

TABLE 106. NUMBER OF INDIVIDUALS WITH HYPERTENSIVE HEART DISEASE[1/] BY RACE, AGE AND SEX, MALAYA

Age (years)	Males 25-44	Males 45-64	Males 65+	Males Total	Males Percent	Females 25-44	Females 45-64	Females 65+	Females Total	Females Percent
Malay										
No. subjects	60	98	20	178	(100)	124	85	12	221	(100)
140/90[2/]	1	0	1	2	(1.1)	1	2	0	3	(2.5)
150/100[2/]	0	0	1	1	(0.6)	0	2	0	2	(1.7)
Diastolic >95	0	0	0	0	(0)	0	0	0	0	(0)
Chinese										
No. subjects	26	52	21	99	(100)	63	57	18	138	(100)
140/90[2/]	2	1	0	3	(3.0)	1	1	0	2	(1.4)
150/100[2/]	0	1	0	1	(1.0)	0	1	0	1	(0.7)
Diastolic >95	2	0	0	2	(2.0)	0	1	0	1	(0.7)
Indian										
No. subjects	48	70	35	153	(100)	25	17	3	45	(100)
140/90[2/]	1	4	2	7	(4.6)	1	0	0	1	(2.2)
150/100[2/]	1	4	2	7	(4.6)	0	0	0	0	(0)
Diastolic >95	0	1	1	2	(1.3)	0	0	0	0	(0)
Total Malaya										
No. subjects	134	220	76	430	(100)	212	159	33	404	(100)
140/90[2/]	4	5	3	12	(2.8)	3	3	0	6	(1.5)
150/100[2/]	1	5	3	9	(2.1)	0	3	0	3	(0.7)
Diastolic >95	2	1	1	4	(0.9)	0	1	0	1	(0.2)

1/ Hypertensive heart disease defined as definite left ventricular hypertrophy by electrocardiogram in the presence of hypertension.

2/ Blood pressure in mm Hg, either systolic or diastolic reading or both of stated value or higher.

TABLE 107. NUMBER OF INDIVIDUALS WITH POSSIBLE HYPERTENSIVE HEART DISEASE[1/] BY RACE, AGE AND SEX, MALAYA

Age (years)	Males					Females				
	25-44	45-65	65+	Total	Percent	25-44	45-64	65+	Total	Percent
Malay										
No. subjects	60	98	20	178	(100)	124	85	12	121	(100)
140/90[2/]	2	2	1	5	(2.8)	5	3	0	8	(6.6)
150/100[2/]	1	2	0	3	(1.7)	4	2	0	6	(5.0)
Diastolic >95	2	2	1	5	(2.8)	5	3	0	8	(6.6)
Chinese										
No. subjects	26	52	21	99	(100)	63	57	18	138	(100)
140/90[2/]	2	2	0	4	(4.0)	4	2	2	8	(5.8)
150/100[2/]	2	2	0	4	(4.0)	2	2	1	5	(3.6)
Diastolic >95	1	1	0	2	(2.0)	3	2	0	5	(3.6)
Indian										
No. subjects	48	70	35	153	(100)	25	17	3	45	(100)
140/90[2/]	3	4	2	9	(5.9)	0	1	0	1	(2.2)
150/100[2/]	3	2	2	7	(4.6)	0	1	0	1	(2.2)
Diastolic >95	3	4	2	9	(5.9)	0	1	0	1	(2.2)
Total Malaya										
No. subjects	134	220	76	430	(100)	212	159	33	404	(100)
140/90[2/]	7	8	3	18	(4.2)	9	6	2	17	(4.2)
150/100[2/]	6	6	2	14	(3.3)	6	5	1	12	(3.0)
Diastolic >95	6	7	3	16	(3.7)	8	6	0	14	(3.5)
Left ventricular hypertrophy alone	1	2	0	3	(0.7)	4	0	0	4	(1.0)

1/ Possible hypertensive heart disease defined as suggestive left ventricular hypertrophy by electrocardiogram in the presence of hypertension, or definite left ventricular hypertrophy in the absence of hypertension.

2/ Blood pressure in mm Hg; either systolic or diastolic reading or both are of stated value or higher.

of hypertensive heart disease in Malaya than in the United States. Khaira reviewed the adult types of heart disease seen during a two-year period at the Penang General Hospital (20). Hypertensive cardiovascular disease was the most common type of heart disease, accounting for 39 percent of 500 cases of heart disease seen in a hospital population. Indians were recorded as having the highest incidence while Malays had the lowest incidence of hypertensive heart disease, which is similar to the results of the present study.

The lower prevalence of hypertensive heart disease in Malaya as contrasted to the United States may be due in part to a much lower incidence of obesity in Malaya. Salt intake data from the food composites of this survey indicate an average daily salt intake per person of 6 to 9 gm for civilians and 11-13 gm for military subjects.1/ Previous ICNND studies in the neighboring rice-economy countries of Thailand and Vietnam (21, 22) found an average daily salt intake per person (14 to 18 gm) which is almost double the usually quoted intakes of 8 to 10 gm for adults in the United States even though hypertension is not exceedingly prevalent in Thailand and Vietnam. If the assumptions of Dahl (23) and others (24) regarding the prominent role of salt in the genesis of hypertension are correct, one would expect a higher prevalence of both hypertension and hypertensive cardiovascular disease in the Malay military subjects than was found in this study. Sodium excretion data are presented in Appendix Tables 72 and 73.

The values are rather low and there appears to be little correlation between sodium excretion and elevated blood pressure levels, plasma cholesterol values, age, or sex. However, 24-hour excretion values should be obtained to further clarify this lack of correlation.

Arteriosclerotic Heart Disease

Questionnaires regarding the presence or past history of heart symptoms and diseases were available on 599 of the group selected for electrocardiographic study. Angina pectoris was recorded if the subjects had a history of intermittent left anterior or substernal chest pain brought on by effort (e.g., exercise, emotional stress, ingestion of food or exposure to cold), relieved by rest or nitroglycerine. Standardization of this point, however, was difficult because of the three languages spoken and differences in interpretation. As a result, 60 percent of the females and 32 percent of the males questioned responded positively. Because of the inordinately high response to this question only those subjects who had a history of angina accompanied by electrocardiographic changes commonly seen in arteriosclerotic heart disease in the absence of any other known heart disease were classified as having arteriosclerotic heart disease. These electrocardiographic changes included left ventricular hypertrophy, complete right or left bundle branch block (QRS >0.12 sec.), atrial fibrillation, primary T-wave changes or possible myocardial infarctions. In addition, all subjects with definite electrocardiographic changes of myocardial infarction were included in the absence of a history of angina. The results shown in Table 108 were no doubt biased by the large number of women who gave a history of chest pain. Thus, 23 females (9.3 percent)

1/ The intake averages for civilians are lower because children are included in the family food composites.

TABLE 108. NUMBER OF INDIVIDUALS WITH PROBABLE ARTERIOSCLEROTIC HEART DISEASE[1/] BY RACE, AGE AND SEX, MALAYA

	Males					Females				
Age (years)	25-44	45-64	65+	Total	Percent	25-44	45-64	65+	Total	Percent
Arteriosclerotic[1/]										
Malay	2	5	4	11	(7.2)	5	6	1	12	(8.6)
No. at risk	50	86	17	153		60	68	11	139	
Chinese	0	3	2	5	(7.1)	0	7	3	10	(12.2)
No. at risk	17	37	16	70		26	47	9	82	
Indian	1	2	0	3	(2.3)	0	0	1	1	(3.7)
No. at risk	38	55	35	128		13	11	3	27	
Total Malaya	3	10	6	19	(5.4)	5	13	5	23	(9.3)
No. at risk	105	178	68	351	(100)	99	129	23	248	(100)
Percent by age group	(2.9)	(5.6)	(8.8)	(5.4)		(5.0)	(10.1)	(21.7)	(9.3)	

1/ Probable arteriosclerotic heart disease defined as history of angina pectoris with an abnormal electrocardiogram (see text).

and 19 males (5.4 percent) were classified as having arteriosclerotic heart disease. Indian males had the lowest prevalence while Chinese females recorded the highest prevalence. Khaira in his study (20) found the incidence of arteriosclerotic heart disease was lower in females than in males, which is generally true in most countries. That this is true in Malaya is supported by the absence of any female subject demonstrating definite electrocardiographic changes of myocardial infarction while there were 7 males (1.5 percent of 457 males with electrocardiograms available for interpretation) who had definite electrocardiographic evidence of myocardial infarction. Another 17 subjects had electrocardiographic changes of a possible myocardial infarction and only 3 of these were recorded from female subjects. The two groups of definite and possible myocardial infarction are shown by race, sex and age in Table 109. Malay males had the highest prevalence of definite myocardial infarctions while Indian males and females had the highest prevalence of probable myocardial infarctions.

Danaraj et al. (25) and Muir (26) estimated the prevalence of coronary heart disease in Singapore after conducting autopsy studies from 1950-1954 and 1948-1957, respectively, in Singapore hospitals. Both studies showed a marked increase in the incidence of coronary heart disease in Indians compared to Chinese. The Indian Moslem was apparently even more susceptible to the development of anatomic coronary artery lesions. The present clinical study did not encounter such a dramatic difference among these racial groups, but the Chinese did have the lowest prevalence of myocardial infarction by electrocardiogram. Although the groups in the present study and those in the autopsy studies were selected according to different criteria and were composed of geographically different populations, further investigations of these differences should be undertaken.

As indicated in the section on diabetes findings, those subjects who were diabetic or had borderline carbohydrate tolerance had higher cholesterol values than subjects with normal carbohydrate tolerance. These same subjects also had a higher prevalence of hypertension (53 percent with blood pressure readings equal to or greater than 140/90, 47 percent equal to or greater than 150/100 and 18 percent with diastolic pressure greater than 95), history of angina pectoris with an abnormal electrocardiogram (13 percent), possible myocardial infarction (4 percent) and electrocardiographic abnormalities (total abnormal, 54 percent). These findings are of interest in the light of the frequent but as yet unexplained arteriosclerotic complications in the diabetic, as well as reported abnormalities of glucose tolerance in subjects with myocardial infarctions and angina.

Males with myocardial infarction, arteriosclerotic heart disease, left ventricular hypertrophy and suggestive left ventricular hypertrophy by electrocardiogram displayed slightly higher mean cholesterol levels than the mean cholesterol levels of the over-all group. These differences are trivial and are not statistically significant. A suggestive correlation between diastolic blood pressure and cholesterol levels, particularly in females, can be seen in the data presented in Table 110. As pointed out previously, however, diastolic blood pressure and cholesterol levels both tended to increase with increasing percent of "standard weight," and this may explain the apparent relationship of diastolic blood pressure with cholesterol. This seems probable because systolic blood pressure showed much less relationship to both "standard weight" and cholesterol levels.

TABLE 109. NUMBER OF INDIVIDUALS WITH MYOCARDIAL INFARCTION AND POSSIBLE MYOCARDIAL INFARCTION AS DEMONSTRATED BY ELECTROCARDIOGRAM BY RACE, SEX AND AGE, MALAYA

Age (years)	Males 25-44	Males 45-64	Males 65+	Males Total	Males Percent	Females 25-44	Females 45-64	Females 65+	Females Total	Females Percent
Myocardial infarction										
Malay	2	1	1	4	(2.2)	0	0	0	0	(0)
No. at risk	60	98	20	178		124	85	12	221	
Chinese	0	1	0	1	(1.0)	0	0	0	0	(0)
No. at risk	26	52	21	99		63	57	18	138	
Indians	0	2	0	2	(1.3)	0	0	0	0	(0)
No. at risk	48	70	35	153		25	17	3	45	
Total Malaya	2	4	1	7	(1.7)	0	0	0	0	(0)
No. at risk	134	220	76	430		212	159	33	404	
Percent by age group	(1.5)	(1.8)	(1.3)	(1.7)		(0)	(0)	(0)	(0)	
Possible myocardial infarction										
Malay	1	1	2	4	(2.2)	0	0	1	1	(0.5)
Chinese	0	1	1	2	(2.0)	0	0	0	0	(0)
Indian	3	1	1	5	(3.3)	1	1	0	2	(4.4)
Total	4	3	4	11	(2.6)	1	1	1	3	(0.7)
Percent by age group	(3.0)	(1.4)	(5.3)	(2.6)		(0.5)	(0.6)	(3.0)	(0.7)	

TABLE 110. COMPARISON OF DIASTOLIC BLOOD PRESSURE AND CHOLESTEROL LEVELS, MALAYA

Plasma cholesterol mg/100 ml	Diastolic Blood Pressure (mm Hg) <70	70-78	80-88	90-98	100+	Total
	Number of Subjects					
	Males					
Total no.	44	68	84	36	31	263
Mean	171	174	186	185	193	180
<150	12	23	22	10	7	74
150-199	22	27	35	14	14	112
200-249	9	14	19	8	6	56
250+	1	4	8	4	4	21
	Females					
Total no.	29	39	59	29	13	169
Mean	169	182	194	193	207	187
<150	10	8	11	3	1	33
150-199	13	20	24	14	4	75
200-249	6	9	17	9	7	48
250+	0	2	7	3	1	13

The recent emphasis of the relationship of a diet rich in saturated fats to the development of arteriosclerotic heart disease is well known. It is of interest that fats comprise less than 25 percent of the average Malayan diet (Chapter VIII, p. 158). The fats consumed are largely saturated, but the overall intake is much lower than in Western countries. Despite the low consumption of saturated fats in Malaya, cholesterol, lipid phosphorus and β-lipoprotein levels were comparable to those in Western countries (Appendix Tables 44, 45 and 46). Several recent epidemiologic studies have cast some doubt on the hypothesis of high animal fat intakes causing hypercholesterolemia and atherosclerosis (27-29). This study would tend to support the latter results from a different viewpoint, namely, that lifelong dietary intakes low in both total fats and animal saturated fats do not necessarily result in low cholesterol or lipid levels with a resulting immunity to the development of arteriosclerosis. Danaraj et al. (25) and Muir (26) concluded, on the basis of their autopsy studies, that coronary heart disease in Singapore was of a similar magnitude to that found in Western countries. There is little doubt that the incidence of arteriosclerotic heart disease in Malaya is significant and will become greater when public health measures resolve preventable diseases and increase longevity. The role of dietary fat in the development of arteriosclerosis must be subjected to more critical analysis along with a host of other factors.

Other Heart Diseases and Electrocardiographic Findings

Other types of heart disease classified by clinical examinations and the classification of electrocardiographic abnormalities are shown in Table 111. Four cases of chronic cor pulmonale and three cases of rheumatic heart disease were clinically evident and constituted the majority of other types of heart disease. It is not surprising that cor pulmonale was found more frequently than rheumatic heart disease when the prevalence of active tuberculosis and the composition of the study group comprising mostly older subjects are considered.

One case of probable luetic aortitis was found and three subjects were classified as having unknown types of heart disease. Significant heart murmurs were present in 28 subjects, but were largely felt to be due either to arteriosclerotic or hypertensive heart disease. It is noteworthy that 11.6 percent of the group studied electrocardiographically had sinus tachycardia recorded. Undoubtedly this finding can be explained best on the basis of anxiety of the subjects confronted with an unfamiliar procedure. By comparison, however, this finding was recorded in only 7.5 percent of subjects in Uruguay under similar conditions (13) and in only 3.6 percent of Malayan military subjects. This higher prevalence of a rapid heart rate might be indicative of a borderline nutritional status. There were no known instances of beriberi heart disease because this diagnosis is usually confirmed only after therapeutic trial.

Nonspecific T-wave changes were the second most common electrocardiographic abnormality recorded, being present in 10.5 percent of the cases. Suggestive left ventricular hypertrophy and incomplete right bundle branch block were next in frequency, being present in 7.8 percent and 4.1 percent of the tracings respectively. Two instances of complete left bundle branch block were recorded, and one tracing displayed atrial fibrillation.

Hypertension and Electrocardiographic Findings in Military Subjects

Blood pressure readings and electrocardiograms were available for comparison from 222 male military subjects from five locations. Only three subjects were not Malays. As shown in Table 112, the younger age range of the group is reflected by the lower prevalence of hypertension and electrocardiographic abnormalities generally. Only one subject was classified as having hypertensive heart disease while 4.5 percent had possible hypertensive heart disease. Suggestive left ventricular hypertrophy was the most common electrocardiographic abnormality (10.8 percent) and incomplete right bundle branch block and nonspecific T-wave changes were observed in 7.7 and 7.2 percent of the tracings, respectively. Three subjects had electrocardiographic changes suggestive of myocardial infarction, which emphasizes the fact that arteriosclerotic heart disease may occur in relatively young individuals.

TABLE 111. ELECTROCARDIOGRAPHIC FINDINGS AND OTHER TYPES OF HEART DISEASE BY RACE AND SEX, MALAYA

	Males				Females			
Electrocardiographic diagnosis	Malay	Chinese	Indian	Total	Malay	Chinese	Indian	Total
No. subjects	196	99	162	457	276	142	51	469
				Percent 1/				
Total abnormal	28	27	34	30	38	42	33	39
Sinus tachycardia	8	10	6	8	19	10	8	15
Primary T-wave changes	6	7	13	9	12	13	14	12
Left ventricular hypertrophy	2	2	5	3	2	2	2	2
Suggestive left ventricular hypertrophy	4	4	10	6	7	15	10	9
Complete right bundle branch block	3	1	1	2	--	2	0	1
Incomplete right bundle branch block	5	5	5	5	4	3	2	3
Interventricular block, left	3	2	6	4	1	2	4	2
Ventricular extrasystoles	2	0	1	1	1	3	4	2
Right ventricular hypertrophy, suggestive right ventricular hypertrophy	2	0	--	1	--	0	0	(3)
Atrial hypertrophy, right	--	1	--	(3)	--	2	0	(4)
Atrial hypertrophy, left	--	0	--	(2)	--	--	--	(3)
Partial arteriovenous block	--	0	0	(1)	0	--	0	(1)
Atrial fibrillation	0	--	0	(1)	0	0	0	0
Clinical Findings				Number of Subjects				
No. subjects	98	43	96	237	78	27	25	130
Significant heart murmurs	4	4	8	16	6	3	3	12
Rheumatic heart disease	1	0	1	2	1	0	0	1
Cor pulmonale	0	1	2	3	1	0	0	1
Luetic heart disease	0	1	0	1	0	0	0	0
Unknown type heart disease	1	0	1	2	0	1	0	1

1/ -- indicates less than one percent; actual number of cases are given in parentheses.

TABLE 112. PREVALENCE OF HYPERTENSION AND ELECTROCARDIOGRAPHIC ABNORMALITIES IN MILITARY SUBJECTS BY AGE, MALAYA

Age (years)	20-24	25-29	30-34	35-41	Total
No. subjects	49	58	81	34	222
	Percent Prevalence				
Blood pressure[1/]					
140/90	10	22	22	21	19
150/100	4	5	6	9	6
Diastolic >95	4	5	6	9	6
Hypertensive heart disease	0	0	1	0	0.5
Possible hypertensive heart disease	2	5	2	12	4.5
Electrocardiographic findings					
Total abnormal	27	36	28	29	30
Sinus tachycardia	4	3	5	0	3.6
Primary T-wave changes	6	10	4	12	7
Left ventricular hypertrophy	0	2	1	6	2
Suggestive left ventricular hypertrophy	10	16	10	6	11
Complete right bundle branch block	2	2	4	3	2.7
Incomplete right bundle branch block	8	9	7	6	7.7
Interventricular block, left	0	2	0	3	1
Ventricular extrasystoles	0	0	1	0	0.5
Right ventricular hypertrophy, suggestive right ventricular hypertrophy	0	0	1	0	0.5
Atrial hypertrophy, right	2	2	0	3	1.4
Atrial hypertrophy, left	2	0	0	0	0.5
Possible myocardial infarction	0	2	2	0	1.4

1/ Blood pressure in mm Hg; either the systolic or diastolic reading or both are of stated value or higher.

Parasitology[1/]

Because of the increasing evidence of correlation between the state of nutrition and parasitologic infestation, it was felt that studies to determine the prevalence of intestinal and other parasites would be a valuable addition to the data obtained in the usual nutritional survey. Accordingly, upon invitation by ICNND, a parasitologic team from the U.S. Naval Medical Research Unit No. 2 (Taipei, Taiwan) joined the survey team on September 3, 1962.

1/ United States Naval Medical Research Unit No. 2 (NAMRU-2) Research Report MR 005.09-1601.3.20. This study was supported in part by funding under Public Law 480, Section 104 (c).

Materials and Methods

When the subject selected for parasitologic study had received the clinical examination, he was given a waxed specimen container marked with his ICNND registration number. A parasitologic survey number was added to the clinical identification number when the stool specimen was received. A portion of the fresh feces was fixed by the MIF (merthiolate-iodine-formalin) method of Sapero and Lawless (30) for later examination. In addition, the MIFC concentration technic of Blagg et al. (15, 31) was employed on each specimen. Prevalences reported, therefore, are based on examinations by two technics.

During the course of the survey 1,280 diurnal and 627 matched diurnal-nocturnal blood films for *Plasmodium* and microfilaria were made for later examination. The results of this study will be available in a later report.

Results and Discussion

The prevalence of intestinal parasites summarized here is based on the results of examination of a single stool specimen from each individual. Indubitably, a series of specimens from each person would have increased the number of positive findings for all species. The mobility necessary for a nutrition survey did not permit detailed epidemiologic studies that could only be accomplished by longer periods of study at each location. However, a great deal of information concerning the prevalence of parasitism which may influence the nutritional status is presented in the following tables.

Table 113 summarizes the 1,983 stool specimens from all population groups received by location. Distribution of 1,359 civilians and military dependents by location, sex, race, whether rural or urban and area of origin (birth) is shown in Table 114. The 85 persons of unknown area of origin listed under Selangor were examined at Sentul (Indian School). Table 115 compares the population by race versus religion in the civilian and military dependent populations; analysis was done by race only since race and religion are closely correlated in Malaya.

Prevalence rates in the military by rural or urban location and by messing practice (whether they eat at home or at the mess) are given in Table 116. Comparison of Tables 116 and 117 demonstrates significant differences in the prevalence rates for parasites of the military and civilian populations, the military rate being lower in both rural and urban locations.

Generally males had a higher parasitic infestation rate than females (Table 118). The higher protozoa infestation rates appeared in the 5-9 and 10-14 year age groups. No parasites were noted in 4.8 percent of the males and 5.9 percent of the females. The rate of occurrence of *Enterobius vermicularis* in males was 6.0 percent and it was 3.9 percent in females; conversely *Endamoeba coli* was present in 21.7 percent of females examined as opposed to 17.9 percent of males. The prevalence of intestinal parasites by age is more realistically shown in the civilians and military dependents than in the military because the military man has greater access to good medical care.

TABLE 113. PARASITOLOGY SPECIMENS COLLECTED BY LOCATION, FEDERATION OF MALAYA, 1962

Village or other specific location	State	Number of specimens
Port Escandar	Selangor	28
Batu		17
Sentul		86
Suleiman Courts		31
Kampong Bheru		14
Surgei Merap Sekalah		28
Battn, RMR[1/]	Kelantan	141
T. Tinggi		107
Ching Chan School		76
Kampong Melor		43
Mulong		13
Battn, RMR	Pahang	87
Lubok Terua (Malay school)		173
Tg. Kerayong		74
Chung Hwa		34
Kampong Melagu (school)	Johore	48
Mengkibol		111
Battn, RMR		62
Kluang		121
Sri Lanlong		20
RECCE, RMR	Malacca	34
Kesangtha		52
Tg. Keling (Malay school)		30
Port Dickson	Negri Sembilan	30
Battn, RMR	Perak	40
Batu Gajah		39
Ben Ban School, Ben Ban Community Center		61
Pusing Village		62
Ampang Bahru		48
Kampong Bercham (Chinese school)		48
Alor Star High School	Kedah	54
Kampong Gunong (Malay school)		108
Battn, RMR		63
	Total	1,983

1/ RMR = Royal Malay Regiment.

TABLE 114. DISTRIBUTION OF 1,359 CIVILIANS AND MILITARY DEPENDENTS BY LOCATION, SEX, RACE, RURAL VS. URBAN AND AREA OF ORIGIN, FEDERATION OF MALAYA, 1962

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
Males	144	93	120	177	136	88	23	38	819
Females	81	66	105	117	81	65	3	22	540
Total	225	159	225	294	217	153	26	60	1,359
Rural	190	144	179	143	217	108	26	60	1,067
Urban	35	15	46	151	--	45	--	--	292
Rural									
Chinese	16	4	3	1	213	3	--	--	240
Malay	113	138	174	140	--	105	26	60	756
Indian	61	2	--	1	2	--	--	--	66
Unknown	--	--	2	1	2	--	--	--	5
Urban									
Chinese	35	5	42	10	--	45	--	--	137
Malay	--	10	3	26	--	--	--	--	39
Indian	--	--	--	115	--	--	--	--	115
Unknown	--	--	1	--	--	--	--	--	1
Area of Origin									
Selangor	--	1	1	194	1	--	--	--	197
Kelantan	--	--	210	1	--	2	--	--	213
Pahang	--	--	--	1	--	146	--	--	147
Johore	204	1	--	--	--	--	--	--	205
Malacca	5	--	6	2	--	3	26	60	102
Perak	--	3	3	--	195	2	--	--	203
Kedah	1	150	1	1	--	--	--	--	153
All others	15	4	4	10	21	--	--	--	54
Unknown	--	--	--	85	--	--	--	--	85
Total	225	159	225	294	217	153	26	60	1,359

TABLE 115. RACE VERSUS RELIGION OF 1,359 CIVILIANS AND MILITARY DEPENDENTS, FEDERATION OF MALAYA, 1962

Religion	Race: Chinese	Malay	Indian	Unknown	Total
Moslem	--	(96.7)1/	(1.1)	--	(56.7)
	--	769	2	--	771
Buddhist	(98.7)	--	--	(33.3)	(27.5)
	372	--	--	2	374
Christian	(1.3)	--	(1.1)	--	(0.5)
	5	--	2	--	7
Hindu	--	--	(97.2)	--	(13.0)
	--	--	176	--	176
Other or none	--	(3.3)	(0.6)	--	(2.0)
	--	26	1	--	27
Unknown	--	--	--	(66.7)	(0.3)
	--	--	--	4	4
Percent	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
Total	377	795	181	6	1,359

1/ Figures in parentheses are percentages.

The prevalence of intestinal parasites in female military dependents and female civilians by location was 88.3 percent for T. trichiura, 66.7 percent for Ascaris, 45.7 percent for hookworm and 4.2 percent for E. histolytica. Those individuals examined at Malacca had the highest hookworm rate, those at Johore the lowest. The states of Kedah and Kelantan had the highest prevalence rate for T. trichiura; Kelantan and Selangor had the highest Ascaris rate and Johore had the lowest as shown in Table 119. Negri Sembilan, not included in Table 119, showed a higher rate for the 3 common helminths, Ascaris, Trichuris and hookworm (Table 120). Table 121 summarizes the prevalence of intestinal parasites in male civilians and military dependents and further points out the higher rate in males as compared to females in the same location (Table 119), and the high rate in civilian males compared to military males in the same location (Table 122), with the exception of Perak. The E. histolytica rate in the military man in Perak was 12.8 percent, in contrast to 2.9 percent in civilian males. However, it should be pointed out that both were small population samples and may not reflect the over-all situation. Likewise, the military man had a much lower rate of parasitism than the civilian female in the same location, with the exception of hookworm in the states of Kedah and Perak. The Ascaris lumbricoides rate was considerably lower in military males than in civilian females, 25.8 percent as opposed to 66.7 percent (Tables 122 and 119, respectively).

TABLE 116. PREVALENCE OF INTESTINAL PARASITES IN 573 MILITARY MEN BY RURAL VS. URBAN AND BY MESSING PRACTICE, FEDERATION OF MALAYA, 1962

	Rural	Urban	Messing Practice On base	Messing Practice At home
Number examined	492	81	283	290
		Helminths		
Ascaris lumbricoides	(25.4)[1] 125	(28.4) 23	(24.7) 70	(26.9) 78
Trichuris trichiura	(74.8) 368	(67.9) 55	(76.3) 216	(71.4) 207
Hookworm species	(50.8) 250	(37.0) 30	(55.1) 156	(42.8) 124
Trichostrongylus species	(0.2) 1	-- --	-- --	(0.3) 1
Diphyllobothrium latum	(0.2) 1	-- --	-- --	(0.3) 1
Enterobius vermicularis	(1.2) 6	-- --	(0.4) 1	(1.7) 5
		Protozoa		
Endamoeba histolytica	(4.5) 22	(2.5) 2	(3.9) 11	(4.5) 13
Endamoeba coli	(11.2) 55	(3.7) 3	(12.0) 34	(8.4) 24
Giardia lamblia	(2.6) 13	(1.2) 1	(2.1) 6	(2.8) 8
Iodamoeba bütschlii	(0.6) 3	-- --	(0.4) 1	(0.9) 2
Endolimax nana	(1.2) 6	-- --	(1.4) 4	(0.7) 2
No parasites observed	(10.8) 53	(17.3) 14	(7.1) 20	(16.2) 47

1/ Figures in parentheses are percentages.

TABLE 117. PREVALENCE OF INTESTINAL PARASITES IN 1,359 CIVILIANS AND MILITARY DEPENDENTS BY STATE AND RURAL VS. URBAN LOCATION, FEDERATION OF MALAYA, 1962

	Rural					
Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang
Number examined	190	144	179	143	217	108
			Helminths			
Ascaris lumbricoides	(55.8)[1/] 106	(77.1) 111	(79.3) 142	(72.0) 103	(68.7) 149	(76.8) 83
Trichuris trichiura	(90.5) 172	(91.0) 131	(95.5) 171	(93.7) 134	(88.0) 191	(93.5) 101
Hookworm species	(42.6) 81	(48.6) 70	(68.2) 122	(68.5) 98	(40.6) 88	(75 0) 81
Trichostrongylus species	-- --	(0.7) 1	(1.7) 3	-- --	(0.5) 1	(0.9) 1
Enterobius vermicularis	(7.9) 15	(6.2) 9	(5.0) 9	(6.3) 9	(1.8) 4	(3.7) 4
Unknown trematode	-- --	-- --	-- --	(1.4) 2	(0.5) 1	-- --
Heterodera marioni	-- --	-- --	-- --	-- --	(0.5) 1	-- --
			Protozoa			
Endamoeba histolytica	(5.3) 10	(14.6) 21	(2.8) 5	(4.2) 6	(2.8) 6	(2.8) 3
Endamoeba coli	(22.1) 42	(34.7) 50	(24.6) 44	(25.9) 37	(7.4) 16	(23.1) 25
Giardia lamblia	(6.3) 12	(6.2) 9	(0.6) 1	(2.1) 3	(4.1) 9	(7.4) 8
Iodamoeba bütschlii	(0.5) 1	(4.9) 7	(0.6) 1	(3.5) 5	-- --	(1.8) 2
Trichomonas species	-- --	-- --	-- --	-- --	-- --	-- --
Endolimax nana	(1.0) 2	(2.1) 3	-- --	-- --	-- --	-- --
No parasites observed	(4.7) 9	(2.1) 3	(0.6) 1	(2.1) 3	(6.0) 13	(0.9) 1

1/ Figures in parentheses are percentages

TABLE 117 (Continued) PREVALENCE OF INTESTINAL PARASITES IN 1,359 CIVILIANS AND MILITARY DEPENDENTS BY STATE AND RURAL VS. URBAN LOCATION, FEDERATION OF MALAYA, 1962

Rural			Urban					
Negri Sembilan	Malacca	Total	Johore	Kedah	Kelantan	Selangor	Pahang	Total
26	60	1,067	35	15	46	151	45	292
				Helminths				
(92.3)	(83.3)	(72.2)	(28.6)	(20.0)	(73.9)	(64.9)	(20.0)	(52.7)
24	53	771	10	3	34	98	9	154
(96.2)	(96.7)	(92.1)	(48.5)	(73.3)	(95.6)	(84.1)	(53.3)	(76.4)
25	58	983	17	11	44	127	24	223
(88.5)	(76.7)	(57.1)	(17.1)	(13.3)	(17.4)	(32.4)	(35.6)	(27.7)
23	46	609	6	2	8	49	16	81
--	--	(0.6)	--	--	--	(0.7)	--	(0.3)
--	--	6	--	--	--	1	--	1
--	(3.3)	(4.9)	--	(6.7)	(4.3)	(7.2)	(8.9)	(6.2)
--	2	52	--	1	2	11	4	18
--	--	(0.3)	--	--	--	(1.3)	--	(0.7)
--	--	3	--	--	--	2	--	2
--	--	(0.1)	--	--	--	--	--	--
--	--	1	--	--	--	--	--	--
				Protozoa				
--	(8.3)	(5.2)	--	--	--	(5.3)	--	(2.7)
--	5	56	--	--	--	8	--	8
(19.2)	(16.7)	(21.5)	--	(13.3)	(6.5)	(19.2)	(2.2)	(12.0)
5	10	229	--	2	3	29	1	35
(3.8)	(8.3)	(4.5)	--	--	(2.2)	(5.3)	--	(3.1)
1	5	48	--	--	1	8	--	9
--	(3.3)	(1.7)	--	--	--	(0.7)	--	(0.3)
--	2	18	--	--	--	1	--	1
--	--	--	--	--	--	(0.7)	--	(0.3)
--	--	--	--	--	--	1	--	1
--	(1.7)	(0.6)	--	--	--	(0.7)	--	(0.3)
--	1	6	--	--	--	1	--	1
--	--	(2.8)	(34.3)	(13.3)	(4.3)	(7.9)	(28.9)	(14.0)
--	--	30	12	2	2	12	13	41

TABLE 118. PREVALENCE OF INTESTINAL PARASITES IN 1,359 CIVILIANS AND MILITARY DEPENDENTS BY AGE AND SEX, FEDERATION OF MALAYA, 1962

	Males					
Age (years)	5-9	10-14	15-24	25-44	45+	Total
Number examined	313	332	59	44	71	819
			Helminths			
Ascaris lumbricoides	(77.3)1/	(69.9)	(59.3)	(45.4)	(50.7)	(69.0)
	242	232	35	20	36	565
Trichuris trichiura	(94.2)	(92.2)	(78.0)	(70.4)	(71.8)	(89.0)
	295	306	46	31	51	729
Hookworm species	(50.8)	(55.4)	(59.3)	(50.0)	(60.6)	(54.1)
	159	184	35	22	43	443
Trichostrongylus species	(0.6)	(0.3)	--	--	--	(0.4)
	2	1	--	--	--	3
Diphyllobothrium latum	(0.3)	--	--	--	--	(0.1)
	1	--	--	--	--	1
Enterobius vermicularis	(6.1)	(6.3)	(6.8)	(4.5)	(4.2)	(6.0)
	19	21	4	2	3	49
Unknown trematode	(1.3)	(0.3)	--	--	--	(0.6)
	4	1	--	--	--	5
Heterodera marioni	--	--	--	--	--	--
	--	--	--	--	--	--
			Protozoa			
Endamoeba histolytica	(5.8)	(6.3)	(1.7)	--	(1.4)	(5.0)
	18	21	1	--	1	41
Endamoeba coli	(13.1)	(25.9)	(13.6)	(6.8)	(12.7)	(17.9)
	41	86	8	3	9	147
Giardia lamblia	(8.0)	(4.8)	(1.7)	--	--	(5.1)
	25	16	1	--	--	42
Iodamoeba bütschlii	(1.3)	(3.3)	--	--	--	(1.8)
	4	11	--	--	--	15
Endolimax nana	(0.6)	(0.9)	--	--	--	(0.6)
	2	3	--	--	--	5
Trichomonas species	--	--	--	(2.3)	--	(0.1)
	--	--	--	1	--	1
No parasites observed	(2.2)	(2.7)	(8.5)	(15.9)	(15.5)	(4.8)
	7	9	5	7	11	39

1/ Figures in parentheses are percentages.

TABLE 118 (Continued) PREVALENCE OF INTESTINAL PARASITES IN 1,359 CIVILIANS AND MILITARY DEPENDENTS BY AGE AND SEX, FEDERATION OF MALAYA, 1962

Females					
5-9	10-14	15-24	25-44	45+	Total
224	191	36	53	36	540
		Helminths			
(69.2)	(71.2)	(52.8)	(60.4)	(50.0)	(66.7)
155	136	19	32	18	360
(90.2)	(90.6)	(91.7)	(84.9)	(66.7)	(88.3)
202	173	33	45	24	477
(44.2)	(44.5)	(50.0)	(47.2)	(55.6)	(45.7)
99	85	18	25	20	247
(0.4)	(0.5)	--	--	(5.6)	(0.7)
1	1	--	--	2	4
--	--	--	--	--	--
--	--	--	--	--	--
(4.5)	(3.7)	--	(5.7)	(2.8)	(3.9)
10	7	--	3	1	21
--	--	--	--	--	--
--	--	--	--	--	--
(0.4)	--	--	--	--	(0.2)
1	--	--	--	--	1
		Protozoa			
(3.1)	(5.8)	(8.3)	--	(5.6)	(4.2)
7	11	3	--	2	23
(19.6)	(24.1)	(22.2)	(20.8)	(22.2)	(21.7)
44	46	8	11	8	117
(2.7)	(4.2)	(2.8)	--	--	(2.8)
6	8	1	--	--	15
(0.9)	(1.0)	--	--	--	(0.7)
2	2	--	--	--	4
--	(1.0)	--	--	--	(0.4)
--	2	--	--	--	2
--	--	--	--	--	--
--	--	--	--	--	--
(5.8)	(3.1)	(2.8)	(11.3)	(16.7)	(5.9)
13	6	1	6	6	32

TABLE 119. PREVALENCE OF INTESTINAL PARASITES IN 540 FEMALE CIVILIANS AND MILITARY DEPENDENTS BY LOCATION, FEDERATION OF MALAYA, 1962

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Malacca	Total
Number examined	81	66	105	117	81	68	22	540
				Helminths				
Ascaris lumbricoides	(43.2)[1]	(69.7)	(76.2)	(75.2)	(66.7)	(60.3)	(72.7)	(66.7)
	35	46	80	88	54	41	16	360
Trichuris trichiura	(82.7)	(93.9)	(94.3)	(89.7)	(85.2)	(80.9)	(90.0)	(88.3)
	67	62	99	105	69	55	20	477
Hookworm species	(34.6)	(39.4)	(53.3)	(41.9)	(38.3)	(58.8)	(77.2)	(45.7)
	28	26	56	49	31	40	17	247
Trichostrongylus species	--	(1.5)	(1.0)	--	(1.2)	(1.5)	--	(0.7)
	--	1	1	--	1	1	--	4
Diphyllobothrium latum	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--
Enterobius vermicularis	(4.9)	(4.5)	(3.8)	(6.8)	--	(2.9)	--	(3.9)
	4	3	4	8	--	2	--	21
Unknown trematode	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--
Heterodera marioni	--	--	--	--	(1.2)	--	--	(0.2)
	--	--	--	--	1	--	--	1
				Protozoa				
Endamoeba histolytica	(1.2)	(18.2)	(2.8)	(3.4)	(2.5)	(1.5)	--	(4.2)
	1	12	3	4	2	1	--	23
Endamoeba coli	(16.0)	(30.3)	(27.6)	(23.1)	(4.9)	(27.9)	(22.7)	(21.7)
	13	20	29	27	4	19	5	117
Giardia lamblia	(2.5)	(4.5)	(1.0)	(2.6)	(3.7)	(2.9)	(4.5)	(2.8)
	2	3	1	3	3	2	1	15
Iodamoeba bütschlii	--	(3.0)	--	--	--	(2.9)	--	(0.7)
	--	2	--	--	--	2	--	4
Endolimax nana	(1.2)	(1.5)	--	--	--	--	--	(0.4)
	1	1	--	--	--	--	--	2
Trichomonas species	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--
No parasites observed	(11.1)	(1.5)	(1.0)	(4.3)	(7.4)	(14.7)	--	(5.9)
	9	1	1	5	6	10	--	32

1/ Figures in parentheses are percentages.

TABLE 120. PREVALENCE OF INTESTINAL PARASITES IN 1,359 CIVILIANS AND MILITARY DEPENDENTS BY LOCATION, FEDERATION OF MALAYA, 1962

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
Number examined	225	159	225	294	217	153	26	60	1,359
				Helminths					
Ascaris lumbricoides	(51.6)[1/]	(71.7)	(78.2)	(68.4)	(68.7)	(60.1)	(92.3)	(88.3)	(68.1)
	116	114	176	201	149	92	24	53	925
Trichuris trichiura	(84.0)	(89.3)	(95.6)	(88.8)	(88.0)	(81.7)	(96.2)	(96.7)	(88.7)
	189	142	215	261	191	125	25	58	1,206
Hookworm species	(38.7)	(45.3)	(57.8)	(50.0)	(40.6)	(63.4)	(88.5)	(76.7)	(50.8)
	87	72	130	147	88	97	23	46	690
Trichostrongylus species	--	(0.6)	(1.3)	(0.3)	(0.5)	(0.6)	--	--	(0.5)
	--	1	3	1	1	1	--	--	7
Diphyllobothrium latum	--	--	--	(0.3)	--	--	--	--	(0.1)
	--	--	--	1	--	--	--	--	1
Enterobius vermicularis	(6.7)	(6.3)	(4.9)	(6.8)	(1.8)	(5.2)	--	(3.3)	(5.2)
	15	10	11	20	4	8	--	2	70
Unknown trematode	--	--	--	(1.4)	(0.5)	--	--	--	(0.4)
	--	--	--	4	1	--	--	--	5
Heterodera marioni	--	--	--	--	(0.5)	--	--	--	(0.1)
	--	--	--	--	1	--	--	--	1
				Protozoa					
Endamoeba histolytica	(4.4)	(13.2)	(2.2)	(4.8)	(2.8)	(2.0)	--	(8.3)	(4.7)
	10	21	5	14	6	3	--	5	64
Endamoeba coli	(18.7)	(32.7)	(20.9)	(22.4)	(7.4)	(17.0)	(19.2)	(16.7)	(19.4)
	42	52	47	66	16	26	5	10	264

TABLE 120 (Continued) PREVALENCE OF INTESTINAL PARASITES IN 1,359 CIVILIANS AND MILITARY DEPENDENTS BY LOCATION, FEDERATION OF MALAYA, 1962

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
Number examined	225	159	225	294	217	153	26	60	1,359
				Protozoa (continued)					
Giardia lamblia	(5.3)	(5.7)	(0.9)	(3.7)	(4.1)	(5.2)	(3.8)	(8.3)	(4.2)
	12	9	2	11	9	8	1	5	57
Iodamoeba bütschlii	(0.4)	(4.4)	(0.4)	(2.0)	--	(1.3)	--	(3.3)	(1.4)
	1	7	1	6	--	2	--	2	19
Endolimax nana	(0.9)	(1.9)	--	(0.3)	--	--	--	(1.7)	(0.5)
	2	3	--	1	--	--	--	1	7
Trichomonas species	--	--	--	(0.3)	--	--	--	--	(0.1)
	--	--	--	1	--	--	--	--	1
No parasites observed	(9.3)	(3.1)	(1.3)	(5.1)	(6.0)	(9.2)	--	--	(5.2)
	21	5	3	15	13	14	--	--	71

1/ Figures in parentheses are percentages.

TABLE 121. PREVALENCE OF INTESTINAL PARASITES IN 819 MALE CIVILIANS AND MILITARY DEPENDENTS BY LOCATION, FEDERATION OF MALAYA, 1962

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
Number examined	144	93	120	177	136	88	23	38	819
				Helminths					
Ascaris lumbricoides	(56.2)[1/] 81	(73.1) 68	(80.0) 96	(63.8) 113	(69.8) 95	(61.4) 54	(91.3) 21	(97.4) 37	(69.0) 565
Trichuris trichiura	(84.7) 122	(86.0) 80	(96.7) 116	(88.1) 156	(89.7) 122	(83.0) 73	(95.6) 22	(100.0) 38	(89.0) 729
Hookworm species	(41.0) 59	(49.4) 46	(61.7) 74	(55.4) 98	(41.9) 57	(67.0) 59	(91.3) 21	(76.3) 29	(54.1) 443
Trichostrongylus species	-- --	-- --	(1.7) 2	(0.6) 1	-- --	-- --	-- --	-- --	(0.4) 3
Diphyllobothrium latum	-- --	-- --	-- --	(0.6) 1	-- --	-- --	-- --	-- --	(0.1) 1
Enterobius vermicularis	(7.6) 11	(7.5) 7	(5.8) 7	(6.8) 12	(2.9) 4	(6.8) 6	-- --	(5.3) 2	(6.0) 49
Unknown trematode	-- --	-- --	-- --	(2.2) 4	(0.7) 1	-- --	-- --	-- --	(0.6) 5
Heterodera marioni	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --
				Protozoa					
Endamoeba histolytica	(6.2) 9	(9.7) 9	(1.7) 2	(5.6) 10	(2.9) 4	(2.3) 2	-- --	(13.2) 5	(5.0) 41
Endamoeba coli	(20.1) 29	(34.4) 32	(15.0) 18	(22.0) 39	(8.8) 12	(9.1) 8	(17.4) 4	(13.2) 5	(17.9) 147
Giardia lamblia	(6.9) 10	(6.4) 6	(0.8) 1	(4.5) 8	(4.4) 6	(6.8) 6	(4.3) 1	(10.5) 4	(5.1) 42
Iodamoeba bütschlii	(0.7) 1	(5.4) 5	(0.8) 1	(3.4) 6	-- --	-- --	-- --	(5.3) 2	(1.8) 15
Endolimax nana	(0.7) 1	(2.2) 2	-- --	(0.6) 1	-- --	-- --	-- --	(2.6) 1	(0.6) 5
Trichomonas species	-- --	-- --	-- --	(0.6) 1	-- --	-- --	-- --	-- --	(0.1) 1
No parasites observed	(8.3) 12	(4.3) 4	(1.7) 2	(5.6) 10	(5.1) 7	(4.5) 4	-- --	-- --	(4.8) 39

1/ Figures in parentheses are percentages.

TABLE 122. PREVALENCE OF INTESTINAL PARASITES IN 573 MILITARY MEN BY LOCATION, FEDERATION OF MALAYA, 1962

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
Number examined	115	63	87	15	39	163	39	52	573
				Helminths					
Ascaris lumbricoides	(13.0)[1/] 15	(33.3) 21	(24.1) 21	(33.3) 5	(46.2) 18	(24.5) 40	(51.3) 20	(15.4) 8	(25.8) 148
Trichuris trichiura	(75.6) 87	(74.6) 47	(64.4) 56	(73.3) 11	(76.9) 30	(76.1) 124	(84.6) 33	(67.3) 35	(73.8) 423
Hookworm species	(47.0) 54	(57.1) 36	(39.1) 34	(33.3) 5	(46.2) 18	(53.4) 87	(46.2) 18	(53.8) 28	(48.9) 280
Trichostrongylus species	(0.9) 1	-- --	-- --	-- --	-- --	-- --	-- --	-- --	(0.2) 1
Diphyllobothrium latum	-- --	-- --	-- --	-- --	(2.6) 1	-- --	-- --	-- --	(0.2) 1
Enterobius vermicularis	(1.7) 2	-- --	(1.1) 1	-- --	-- --	(1.8) 3	-- --	-- --	(1.0) 6
Unknown trematode	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --
Heterodera marioni	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --
				Protozoa					
Endamoeba histolytica	(6.1) 7	(4.8) 3	(2.3) 2	-- --	(12.8) 5	(1.2) 2	(5.1) 2	(5.8) 3	(4.2) 24
Endamoeba coli	(8.7) 10	(7.9) 5	(5.7) 5	-- --	(15.4) 6	(9.2) 15	(30.8) 12	(9.6) 5	(10.1) 58
Giardia lamblia	(7.0) 8	(1.6) 1	-- --	-- --	(2.6) 1	(0.6) 1	(7.7) 3	-- --	(2.4) 14
Iodamoeba bütschlii	(1.7) 2	(1.6) 1	-- --	-- --	-- --	-- --	-- --	-- --	(0.5) 3
Endolimax nana	-- --	(1.6) 1	-- --	-- --	(5.1) 2	-- --	(5.1) 2	(1.9) 1	(1.0) 6
Trichomonas species	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --	-- --
No parasites observed	(10.4) 12	(4.8) 3	(18.4) 16	(26.7) 4	(15.4) 6	(9.8) 16	(2.6) 1	(17.3) 9	(11.7) 67

1/ Figures in parentheses are percentages.

Although the state of Trengganu was not among those surveyed, a military man who originated from that state had the highest Ascaris and Trichuris rates. This individual had 3 times the average Ascaris rate, although, on the other hand, he had the lowest hookworm rate. In general the military man had lower prevalence rates than the civilian man who originally came from the same area. For example, the prevalence rate in the military in Malacca was 16.8 percent in contrast to a rate of 79.4 percent for the civilians (see Tables 123 and 124). In most cases, the prevalence of intestinal parasites was highest in the Malay, and lowest in the Chinese civilians and military dependents (Table 125). As expected, with the exception of E. vermicularis, the infestation rate was higher in the rural locale. The rural Malay had the highest Ascaris rate, 75.9 percent; the urban Indian was next with a rate of 73.0 percent; the rural Chinese followed, and the lowest rural rate was found in the Indian, 54.5 percent (Table 126).

Tables 127 and 128 summarize hematocrit-hemoglobin values by prevalence of hookworm versus nonhookworm in the civilian and military populations. The numbers of persons on whom both hematology and parasitologic data were available were very small. All rates were consistent with a lower hematologic index in those individuals with hookworm although data were only "statistically significant" for civilian males. Table 129 summarizes the multiple infestation rate of parasite species at each location. Diphyllobothrium latum was rare. No Schistosome, Clonorchis, Paragonimus, or Taenia species were found.

Summary

The prevalence of intestinal protozoa and helminths from more than 2,000 persons of different ages, ethnic groups and localities in the Federation of Malaya was determined by examination of a single stool specimen by the MIF and MIFC technics. Over-all prevalence of intestinal parasites ranged from 50 to 100 percent by location. Of the people surveyed 92.5 percent harbored one or more parasites. The military prevalence rates were considerably lower than those of the civilians and military dependents.

Of the 13 parasites found, Trichuris trichiura (81-100 percent prevalence) was the most common helminth followed by Ascaris lumbricoides (15-97 percent) and hookworm (34-91 percent). These results confirm earlier observations that helminth infestation is serious, particularly in young children. Prevalence of Endamoeba histolytica ranged from 0-13 percent and Endamoeba coli from 7.4-33 percent by location. Enterobius vermicularis averaged 5.2 percent by location. Diphyllobothrium latum was rare. Schistosome, Clonorchis, Paragonimus and Taenia species were not found.

TABLE 123. PREVALENCE OF INTESTINAL PARASITES IN 573 MILITARY MEN BY AREA OF ORIGIN, FEDERATION OF MALAYA, 1962

Area of Origin	Selangor	Kelantan	Pahang	Johore	Malacca	Perak	Kedah	Trengganu	Penang	All others	Total
Number examined	33	40	24	76	173	125	45	14	27	16	573
					Helminths						
Ascaris lumbricoides	(36.4)[1/]	(32.5)	(16.7)	(36.8)	(16.8)	(26.4)	(20.0)	(84.3)	(25.9)	(25.0)	(25.8)
	12	13	4	28	29	33	9	9	7	4	148
Trichuris trichiura	(78.8)	(87.5)	(66.7)	(86.8)	(64.7)	(73.6)	(73.3)	(92.8)	(70.4)	(68.8)	(73.8)
	24	35	16	66	112	92	33	13	19	11	423
Hookworm species	(42.4)	(57.5)	(54.2)	(44.7)	(52.0)	(42.4)	(53.3)	(35.7)	(55.6)	(56.2)	(48.9)
	14	23	13	34	90	53	24	5	15	9	280
Trichostrongylus species	--	--	--	--	(0.6)	--	--	--	--	--	(0.2)
	--	--	--	--	1	--	--	--	--	--	1
Diphyllobothrium latum	--	--	--	--	--	--	--	(7.1)	--	--	(0.2)
	--	--	--	--	--	--	--	1	--	--	1
Enterobius vermicularis	--	--	(4.2)	--	(1.2)	--	(6.7)	--	--	--	(1.0)
	--	--	1	--	2	--	3	--	--	--	6
					Protozoa						
Endamoeba histolytica	(3.0)	(2.5)	(12.5)	(1.3)	(5.8)	(5.6)	(2.2)	--	--	--	(4.2)
	1	1	3	1	10	7	1	--	--	--	24
Endamoeba coli	(9.1)	(2.5)	(25.0)	(13.2)	(6.9)	(16.8)	(11.1)	--	--	--	(10.1)
	3	1	6	10	12	21	5	--	--	--	58
Giardia lamblia	--	(7.5)	--	(3.9)	(2.3)	(2.4)	--	(7.1)	--	--	(2.4)
	--	3	--	3	4	3	--	1	--	--	14
Iodamoeba bütschlii	--	--	(4.2)	(1.3)	--	(0.8)	--	--	--	--	(0.5)
	--	--	1	1	--	1	--	--	--	--	3
Endolimax nana	(3.0)	--	--	(1.3)	(1.2)	(1.6)	--	--	--	--	(1.0)
	1	--	--	1	2	2	--	--	--	--	6
No parasites observed	(12.1)	(5.0)	(8.3)	(7.9)	(15.6)	(11.2)	(13.3)	--	(14.8)	(12.5)	(11.7)
	4	2	2	6	27	14	6	--	4	2	67

1/ Figures in parentheses are percentages.

TABLE 124. PREVALENCE OF INTESTINAL PARASITES IN 1,359 CIVILIANS AND MILITARY DEPENDENTS BY AREA OF ORIGIN, FEDERATION OF MALAYA, 1962

Area of Origin	Selangor	Kelantan	Pahang	Johore	Malacca	Perak	Kedah	All others	Unknown	Total
Number examined	197	213	147	205	102	203	153	54	85	1,359
					Helminths					
Ascaris lumbricoides	(66.0)[1/]	(80.8)	(60.5)	(55.6)	(79.4)	(72.9)	(71.9)	(20.4)	(82.4)	(68.1)
	130	172	89	114	81	148	110	11	70	925
Trichuris trichiura	(91.4)	(96.7)	(81.0)	(89.3)	(92.2)	(92.1)	(90.8)	(38.9)	(90.6)	(88.7)
	180	206	119	183	94	187	139	21	77	1,206
Hookworm species	(60.9)	(61.0)	(62.6)	(42.0)	(72.5)	(36.4)	(45.8)	(35.2)	(29.4)	(50.8)
	120	130	92	86	74	74	70	19	25	690
Trichostrongylus species	--	(1.4)	(0.7)	--	--	--	(0.6)	(1.8)	(1.2)	(0.5)
	--	3	1	--	--	--	1	1	1	7
Diphyllobothrium latum	(0.5)	--	--	--	--	--	--	--	--	(0.1)
	1	--	--	--	--	--	--	--	--	1
Enterobius vermicularis	(6.6)	(5.2)	(5.4)	(7.3)	(2.0)	(2.0)	(6.5)	--	(8.3)	(5.2)
	13	11	8	15	2	4	10	--	7	70
Unknown trematode	(2.0)	--	--	--	--	(0.5)	--	--	--	(0.4)
	4	--	--	--	--	1	--	--	--	5
Heterodera marioni	--	--	--	--	--	(0.5)	--	--	--	(0.1)
	--	--	--	--	--	1	--	--	--	1
				Protozoa						
Endamoeba histolytica	(3.6)	(2.3)	(2.0)	(4.9)	(4.9)	(2.4)	(13.1)	(3.7)	(8.3)	(4.7)
	7	5	3	10	5	5	20	2	7	64
Endamoeba coli	(23.4)	(22.1)	(15.6)	(20.5)	(17.6)	(8.4)	(32.7)	(9.2)	(18.8)	(19.4)
	46	47	23	42	18	17	50	5	16	264

TABLE 124 (Continued) **PREVALENCE OF INTESTINAL PARASITES IN 1,359 CIVILIANS AND MILITARY DEPENDENTS BY AREA OF ORIGIN, FEDERATION OF MALAYA, 1962**

Area of Origin	Selangor	Kelantan	Pahang	Johore	Malacca	Perak	Kedah	All others	Unknown	Total
Number examined	197	213	147	205	102	203	153	54	85	1,359
					Protozoa (continued)					
Giardia lamblia	(1.5) 3	(0.9) 2	(4.8) 7	(5.8) 12	(6.9) 7	(4.4) 9	(5.9) 9	-- --	(9.4) 8	(4.2) 57
Iodamoeba bütschlii	(2.5) 5	(0.5) 1	(1.4) 2	(0.5) 1	(2.0) 2	-- --	(4.6) 7	-- --	(1.2) 1	(1.4) 19
Endolimax nana	(0.5) 1	-- --	-- --	(1.0) 2	(1.0) 1	-- --	(2.0) 3	-- --	-- --	(0.5) 7
Trichomonas species	-- --	-- --	-- --	-- --	-- --	-- --	-- --	(1.8) 1	-- --	(0.1) 1
No parasites observed	(4.6) 9	(0.9) 2	(10.2) 15	(5.4) 11	(2.9) 3	(5.4) 11	(1.3) 2	(31.5) 17	(1.2) 1	(5.2) 71

1/ Figures in parentheses are percentages.

TABLE 125. PREVALENCE OF INTESTINAL PARASITES IN CIVILIANS AND MILITARY DEPENDENTS BY RACE AND BY RURAL VS. URBAN, FEDERATION OF MALAYA, 1962

Race	Chinese	Malay	Indian	Unknown	Total	Rural	Urban
Number examined	377	795	181	6	1,359	1,067	292
				Helminths			
Ascaris lumbricoides	(56.8)[1/]	(74.0)	(66.3)	(50.0)	(68.1)	(72.2)	(52.7)
	214	588	120	3	925	771	154
Trichuris trichiura	(76.1)	(94.8)	(88.4)	(83.3)	(88.7)	(92.1)	(76.4)
	287	754	160	5	1,206	983	223
Hookworm species	(32.6)	(60.1)	(47.5)	(50.0)	(50.8)	(57.1)	(27.7)
	123	478	86	3	690	609	81
Trichostrongylus species	(0.3)	(0.6)	(0.6)	--	(0.5)	(0.6)	(0.3)
	1	5	1	--	7	6	1
Diphyllobothrium latum	--	(0.1)	--	--	(0.1)	(0.1)	--
	--	1	--	--	1	1	--
Enterobius vermicularis	(3.2)	(5.5)	(7.7)	--	(5.2)	(4.9)	(6.2)
	12	44	14	--	70	52	18
Unknown trematode	(0.3)	(0.2)	(1.1)	--	(0.4)	(0.3)	(0.7)
	1	2	2	--	5	3	2
Heterodera marioni	(0.3)	--	--	--	(0.1)	(0.1)	--
	1	--	--	--	1	1	--
				Protozoa			
Endamoeba histolytica	(1.6)	(5.9)	(6.1)	--	(4.7)	(5.2)	(2.7)
	6	47	11	--	64	56	8
Endamoeba coli	(5.6)	(25.0)	(23.8)	(16.7)	(19.4)	(21.5)	(12.0)
	21	199	43	1	264	229	35

TABLE 125 (Continued) PREVALENCE OF INTESTINAL PARASITES IN CIVILIANS AND MILITARY DEPENDENTS BY RACE AND BY RURAL VS. URBAN, FEDERATION OF MALAYA, 1962

Race	Chinese	Malay	Indian	Unknown	Total	Rural	Urban
Number examined	377	795	181	6	1,359	1,067	292
				Protozoa (continued)			
Giardia lamblia	(2.9)	(4.4)	(6.1)	--	(4.2)	(4.5)	(3.1)
	11	35	11	--	57	48	9
Iodamoeba bütschlii	--	(2.3)	(0.6)	--	(1.4)	(1.7)	(0.3)
	--	18	1	--	19	18	1
Endolimax nana	--	(0.5)	(1.6)	--	(0.5)	(0.6)	(0.3)
	--	4	3	--	7	6	1
Trichomonas species	--	--	(0.6)	--	(0.1)	--	(0.3)
	--	--	1	--	1	--	1
No parasites observed	(14.6)	(1.2)	(3.3)	--	(5.2)	(2.8)	(14.0)
	55	10	6	--	71	30	41

1/ Figures in parentheses are percentages.

TABLE 126. PREVALENCE OF INTESTINAL PARASITES IN CIVILIANS AND MILITARY DEPENDENTS, RURAL AND URBAN BY RACE, FEDERATION OF MALAYA, 1962

Race	Rural					Urban				
	Malay	Indian	Chinese	Unknown	Total	Malay	Indian	Chinese	Unknown	Total
Number examined	756	66	240	5	1,067	39	115	137	1	292
					Helminths					
Ascaris lumbricoides	(75.9)[1/]	(54.5)	(65.8)	(60.0)	(72.2)	(35.9)	(73.0)	(40.9)	--	(52.7)
	574	36	158	3	771	14	84	56	--	154
Trichuris trichiura	(95.1)	(89.4)	(83.8)	(80.0)	(92.1)	(89.7)	(87.8)	(62.8)	(100.0)	(76.4)
	719	59	201	4	983	35	101	86	1	223
Hookworm species	(62.3)	(65.2)	(38.3)	(60.0)	(57.1)	(17.9)	(37.4)	(22.6)	--	(27.7)
	471	43	92	3	609	7	43	31	--	81
Trichostrongylus species	(0.7)	--	(0.4)	--	(0.6)	--	(0.9)	--	--	(0.3)
	5	--	1	--	6	--	1	--	--	1
Diphyllobothrium latum	(0.1)	--	--	--	(0.1)	--	--	--	--	--
	1	--	--	--	1	--	--	--	--	--
Enterobius vermicularis	(5.6)	(7.6)	(2.1)	--	(4.9)	(5.1)	(7.8)	(5.1)	--	(6.2)
	42	5	5	--	52	2	9	7	--	18
Unknown trematode	(0.3)	--	(0.4)	--	(0.3)	--	(1.7)	--	--	(0.7)
	2	--	1	--	3	--	2	--	--	2
Heterodera marioni	--	--	(0.4)	--	(0.1)	--	--	--	--	--
	--	--	1	--	1	--	--	--	--	--
					Protozoa					
Endamoeba histolytica	(6.2)	(4.5)	(2.5)	--	(5.2)	--	(7.0)	--	--	(2.7)
	47	3	6	--	56	--	8	--	--	8
Endamoeba coli	(25.4)	(28.8)	(7.1)	(20.0)	(21.5)	(17.9)	(20.9)	(2.9)	--	(12.0)
	192	19	17	1	229	7	24	4	--	35

TABLE 126 (Continued) PREVALENCE OF INTESTINAL PARASITES IN CIVILIANS AND MILITARY DEPENDENTS, RURAL AND URBAN BY RACE, FEDERATION OF MALAYA, 1962

Race	Rural					Urban				
	Malay	Indian	Chinese	Unknown	Total	Malay	Indian	Chinese	Unknown	Total
Number examined	756	66	240	5	1,067	39	115	137	1	292
					Protozoa (continued)					
Giardia lamblia	(4.6)	(4.5)	(4.2)	--	(4.5)	--	(7.0)	(0.7)	--	(3.1)
	35	3	10	--	48	--	8	1	--	9
Iodamoeba bütschlii	(2.4)	--	--	--	(1.7)	--	(0.9)	--	--	(0.3)
	18	--	--	--	18	--	1	--	--	1
Endolimax nana	(0.5)	(3.0)	(0.4)	--	(0.6)	--	(0.9)	--	--	(0.3)
	4	2	1	--	6	--	1	--	--	1
Trichomonas species	--	--	--	--	--	--	(0.9)	--	--	(0.3)
	--	--	--	--	--	--	1	--	--	1
No parasites observed	(1.0)	(1.5)	(8.8)	--	(2.8)	(5.1)	(4.3)	(24.8)	--	(14.0)
	8	1	21	--	30	2	5	34	--	41

1/ Figures in parentheses are percentages.

TABLE 127. DISTRIBUTION OF HEMOGLOBIN AND HEMATOCRIT VALUES IN 573 MILITARY MEN IN PRESENCE OR ABSENCE OF HOOKWORM, FEDERATION OF MALAYA, 1962

Hemoglobin gm/100 ml	With hookworm	Without hookworm	Total
Number	29	29	58
Mean	15.62	16.04	15.83
S.E.1/	0.24	0.36	0.22
12.0		2	2
13.0	3	1	4
14.0	5	5	10
15.0	11	5	16
16.0	4	7	11
17.0	5	7	12
18.0	1	1	2
19.0			--
22.0		1	1

Hematocrit	With hookworm	Without hookworm	Total
Number	27	29	56
Mean	44.3	44.5	44.4
S.E.	0.61	0.74	0.48
34	1		1
39	1	3	4
40	1	3	4
41	1	2	3
42	2	2	4
43	1	4	5
44	5	2	7
45	3	1	4
46	5	2	7
47	6	2	8
48		3	3
49	1		1
50		3	3
51		1	1
52		1	1

1/ S.E. = standard error.

TABLE 128. DISTRIBUTION OF HEMOGLOBIN AND HEMATOCRIT VALUES IN 1,359 CIVILIANS AND MILITARY DEPENDENTS IN PRESENCE OR ABSENCE OF HOOKWORM, FEDERATION OF MALAYA, 1962

Hemoglobin gm/100 ml	No. males With hookworm	No. males Without hookworm	No. males Total	No. females With hookworm	No. females Without hookworm	No. females Total
Number	31	19	50	18	27	45
Mean	12.69	14.07	13.22	12.66	13.53	13.18
S.E.[1/]	0.37	0.43	0.29	0.42	0.32	0.26
8.0	3		3			--
9.0	1		1	2	2	4
10.0		1	1	3		3
11.0	6		6	1		1
12.0	5	4	9	3	7	10
13.0	7	5	12	4	8	12
14.0	6	5	11	5	5	10
15.0	2	1	3		3	3
16.0	1	1	2		2	2
17.0		1	1			--
18.0		1	1			--
Hematocrit percent						
Number	31	18	49	18	25	43
Mean	39.7	41.0	40.2	39.0	39.2	39.1
S.E.	0.99	1.10	0.74	0.95	0.51	0.49
23	1		1			--
25	1		1			--
32			--	1		1
33		1	1	1	1	2
34			--			--
35	1		1	3	1	4
36	2	1	3		3	3
37	4	2	6	1	2	3
38	2	2	4	2	1	3
39	2	2	4	1	3	4
40	4	2	6	4	5	9
41	3	1	4		5	5
42	1	1	2	1	3	4
43	4	2	6	1	1	2
44	2		2	1		1
45	1	1	2	1		1
46	1		1	1		1
47			--			--
48	1	1	2			--
49		1	1			--
50	1	1	2			--

1/ S.E. = standard error.

TABLE 129. NUMBER OF PARASITE SPECIES PER PERSON BY LOCATION, FEDERATION OF MALAYA, 1962

Location	Species #1	#2	#3	#4	#5	#6	No finding[1]	Total positive
Fort Escandar	2 (7.4)[2]	1 (3.7)	20 (74)	3 (11.11)	1 (3.7)	0	0	27 (100)
Batu	4 (23.5)	6 (35.3)	3 (17.6)	--	--	--	4 (23.5)	13 (76.5)
Sentul	8 (9.4)	40 (47)	23 (27)	11 (12.9)	--	2 (2.35)	1 (1.17)	84 (99)
Suleiman Courts	5 (16.1)	7 (22.3)	9 (29)	3 (9.67)	3 (9.67)	--	4 (12.9)	27 (87)
Kampong Bheru	4 (28.5)	--	3 (21.4)	--	--	--	7 (50)	7 (50)
Surgei Merap Sekalah	7 (26.9)	11 (42.2)	4 (15.3)	2 (7.68)	--	--	2 (7.68)	24 (92.3)
Battn, RMR[3]	9 (6.4)	40 (28.8)	57 (41)	28 (20)	4 (2.87)	--	1 (0.72)	138 (99.2)
Tg. Tinggi	37 (41.5)	24 (26.9)	9 (1.01)	2 (2.25)	--	--	17 (19.1)	72 (80.8)
	12 (66.7)	1 (5.55)	2 (11.1)	--	--	--	3 (16.6)	15 (83.3)
Ching Chan School	3 (3.92)	19 (25)	43 (56.5)	10 (13.1)	1 (1.3)	--	0	76 (100)
Kampong Melor	6 (13.9)	25 (58)	10 (23.2)	1 (2.32)	--	--	1 (2.32)	42 (97.6)
Mulong	1 (7.7)	5 (38.4)	6 (46)	1 (7.69)	--	--	--	13 (100)
Battn, RMR	1 (1.16)	24 (27.8)	42 (49.0)	15 (17.4)	4 (4.65)	--	1 (1.16)	86 (98.7)
Lubok Terua (Malay school)	52 (31.0)	70 (42.9)	20 (12.6)	5 (3.1)	--	--	16 (9.9)	147 (90.1)
	3 (30)	1 (10)	3 (30)	1 (10)	--	--	2 (20)	8 (80)
Tg. Kerayong	4 (5.55)	13 (18)	31 (43)	20 (27.7)	4 (5.55)	--	--	72 (100)
Chung Hwa	4 (11.7)	13 (38.2)	14 (41)	1 (2.94)	--	--	2 (5.86)	32 (94)

TABLE 129 (Continued) NUMBER OF PARASITE SPECIES PER PERSON BY LOCATION, FEDERATION OF MALAYA, 1962

Location	Species #1	#2	#3	#4	#5	#6	No finding[1/]	Total positive
Kampong Melagu (school)	19	8	7	--	--	--	14	34
	(39.5)	(16.7)	(14.6)				(29.1)	(70.9)
Mengkibol	22	40	35	10	--	1	2	108
	(20)	(36.3)	(31.8)	(9.1)		(0.91)	(1.83)	(98.1)
Battn, RMR	9	17	20	11	2	1	1	60
	(14.7)	(27.8)	(32.7)	(18)	(3.27)	(1.67)	(1.67)	(98.2)
Kluang	48	40	13	5	1	--	14	107
	(39.8)	(33.1)	(10.8)	(4.1)	(0.8)		(11.6)	(88.5)
Sri Lanlong	7	4	--	--	--	--	9	11
	(35)	(20)					(45)	(55)
RECCE, RMR	13	8	5	--	--	--	8	26
	(38.2)	(23.6)	(14.7)				(23.4)	(76.5)
Kesangtha	16	18	8	1	--	--	9	43
	(30.7)	(34.6)	(15.3)	(1.92)			(17.3)	(82.7)
Tg. Keling (Malay school)	--	7	15	4	2	2	--	30
		(23.3)	(50)	(13.3)	(6.65)	(6.65)		(100)
Port Dickson	2	9	13	5	1	--	--	30
	(6.65)	(30)	(43.3)	(16.6)	(3.33)			(100)
Battn, RMR	7	13	16	3	--	--	1	39
	(17.9)	(33.3)	(40.0)	(7.69)			(2.56)	(97.4)
Batu Gajah	6	11	11	5	--	--	6	33
	(15.3)	(28.1)	(28.1)	(12.8)			(15.3)	(81.6)
Ben Ban School, Ben Ban	5	37	18	--	1	--	--	61
Community Center	(81.9)	(60.6)	(29.5)		(1.63)			(100)
Pusing Village	11	18	16	4	1	--	3	50
	(20.7)	(33.9)	(30.9)	(7.54)	(1.87)		(5.66)	(94.4)
	3	4	1	--	--	--	1	8
	(33.3)	(44.4)	(11.1)				(11.1)	(88.8)
Ampang Bahru	8	19	16	2	--	--	3	45
	(16.6)	(39.6)	(33.3)	(4.16)			(6.24)	(93.6)
Kampong Bercham (Chinese	9	5	4	2	--	--	6	20
school)	(34.5)	(19.2)	(15.3)	(76.9)			(23)	(77)
	1	6	13	2	--	--	--	22
	(4.54)	(27.2)	(59.1)	(9.09)				(100)

TABLE 129 (Continued) NUMBER OF PARASITE SPECIES PER PERSON BY LOCATION, FEDERATION OF MALAYA, 1962

	Species						No	Total
Location	#1	#2	#3	#4	#5	#6	finding[1/]	positive
Alor Star High School	18	16	11	4	--	--	5	49
	(33.3)	(29.6)	(20.3)	(74.2)			(9.25)	(90.7)
Kampong Gunong (Malay school)	4	25	42	24	9	4	0	108
	(3.8)	(23.1)	(40)	(22.8)	(8.3)	(3.8)		(100)
Battn, RMR	21	27	9	2	1	--	3	60
	(33.3)	(42.8)	(14.2)	(3.17)	(1.58)		(4.76)	(95.2)
Total	391	632	572	187	35	10	146	1,827
	(19.8)	(31.7)	(28.9)	(9.5)	(1.8)	(0.5)	(7.4)	(93.3)

1/ Ten vials were broken.
2/ Figures in parentheses are percentages.
3/ RMR = Royal Malay Regiment.

Dietary Fatty Acid Analyses

Methods

In order to obtain additional information concerning the nature of the fat consumed in the diet, part of the diet composites collected was analyzed for content of individual fatty acids.

The diet samples were extracted by heating for 30 minutes at 50° C after the addition of 75 volumes of a chloroform-methanol mixture (2:1, volume for volume). The extract containing the lipids was filtered and reduced to dryness with a stream of nitrogen gas. The residue was dissolved in chloroform, dried with anhydrous sodium sulfate, and filtered into tared flasks. The chloroform was removed with the aid of nitrogen and the weight of the lipid material was obtained. The lipid extracts were then saponified with 0.5 N alcoholic potassium hydroxide for 40 minutes. After acidification with 1 N hydrochloric acid, the samples were extracted twice with ethyl ether and the extracts were dried over anhydrous sodium sulfate. Esterification of the extracts was carried out with methanol-boron trifluoride (32), and the methyl esters were purified by sublimation (33).

The gas chromatograph was equipped with a hydrogen flame detector. The column was 8 ft long, 1/8" outer diameter (O.D.) stainless steel packed with 20 percent DEGS[1/] precipitated according to Craig (34) on 100-120 mesh siliconized (35) Gas Chrom P[2/]. Helium flow was regulated so that the retention time of the methyl palmitate was 6 minutes at 190°. Identification was by comparison of retention values with those of known standards[2/,3/] before and after hydrogenation. Also, the logarithm of the retention time was plotted against the number of carbon atoms in each homologous series and the linear relationship observed. Calculations were by height times width at half height. Linearity of instrument was checked daily with standards[2/,3/].

Results

Tables 130 and 131 present data on the fatty acid composition of the fat present in the individual diet composites obtained from the locations indicated.

The lipids in the diets contained, on an approximate average, 75 percent saturated, 15 percent monounsaturated, and only 9.5 percent polyunsaturated fatty acids These results reflect the use of coconut oil in the diet since lauric and myristic acids represented major fatty acids in the lipids. Stearic acid was present in the lipids of the civilian diets in amounts ranging from 3.3 to 6.0 percent, while in the case of the military diets, it ranged from 6.3 to 12.9 percent.

1/ Obtained from Cambridge Industries, Cambridge, Massachusetts.

2/ Obtained from Applied Science Laboratories, State College, Pennsylvania.

3/ Obtained from Hormel Institute, Austin, Minnesota.

TABLE 130. FATTY ACID COMPOSITION OF LIPIDS IN CIVILIAN DIETS, MALAYA

Location	Kelantan		Kelantan		Pahang		Johore		Malacca		Perak		Kedah	
Preparation[1]	R	C	R	C	R	C	R	C	R	C	R	C	R	C
Fatty acid[2]	Percent Fatty Acid in Lipids													
C_8:0	T[3]		T	2.8	2.9	1.2	2.3	3.6	1.7	2.0	1.3	2.1	T	1.3
C_{10}:0	3.9	3.5	1.7	4.1	3.1	3.3	4.3	5.1	3.9	3.2	4.0	3.9	3.3	3.0
C_{12}:0	27.3	33.7	20.8	25.4	40.6	34.4	41.9	38.9	33.3	28.1	45.5	35.8	44.7	32.7
C_{14}:0	22.2	18.4	14.8	14.3	17.4	14.8	16.3	17.0	15.0	13.6	17.0	14.9	17.0	16.8
C_{15}:0	T	T	1.9	1.9	T	2.9	T	1.4	T	1.2	0.6	1.3	T	1.1
C_{16}:0	17.0	15.4	21.0	17.8	12.6	13.0	11.4	12.5	12.3	16.7	10.3	14.1	11.3	13.8
C_{16}:1	T	1.9	5.9	2.6	T	2.5	2.9	1.4	3.0	1.8	2.0	1.9	2.3	2.3
C_{17}:0	T	T	T	T	T	T	T	T	T		T		T	
X[4]				T				T						
C_{18}:0	6.0	5.6	5.6	5.0	4.4	4.8	3.8	3.9	3.9	4.6	3.3	4.6	3.8	4.6
C_{18}:1	12.5	12.7	12.0	13.9	9.3	11.7	8.8	8.6	14.8	11.1	11.1	11.0	10.9	13.7
C_{18}:2	8.1	7.3	10.1	10.2	8.3	7.7	7.2	6.1	10.5	15.0	4.2	8.6	5.6	8.0
C_{18}:3	1.3	0.7	2.8	1.1	1.4	1.5	1.1	0.9	1.4	1.5	0.5	1.4	0.8	1.0
C_{20}:0	T	0.6	T	0.8	T	1.4	T	0.5	T	0.8	T	T	T	0.7
C_{22}:0	T	T	T	T	T	T	T	T	T	T	T	0.3	T	T
X[5]	0.7	0.4	1.1	T	T	0.8	T	T	T	0.4	0.1	T	0.1	0.4
X[6]	1.0	T	2.2	T	T	T	<0.5	T		T	T	T	T	0.8

1/ R = raw; C = cooked.

2/ An unknown saturated compound was present in most diets with the same retention time as the oleic acid and is reported as part of the oleic acid. The compound represented less than 1 percent of the total fatty acids. Several peaks were usually found after the linolenic acid peak; in most cases the total amount of these compounds would be less than 2 percent of all fatty acids and was not included in the calculations. Other odd-chain saturated fatty acids were found to a small degree in the diets and were omitted in the calculations.

3/ Trace.

4/ X = an unknown fatty acid that precedes the stearic acid peak which is tentatively indicated as a C_{18}:0 branched acid. The compound is present in most diets, but masked in many instances by the stearic acid peak.

5/ Possibly a C_{20}:4 or C_{22}:1 fatty acid.

6/ Possibly a C_{24}:0 or C_{20}:5 fatty acid.

TABLE 131. FATTY ACID COMPOSITION OF LIPIDS IN MILITARY DIETS,[1] MALAYA

State	Kelantan	Pahang	Johore	Malacca	Perak	Kedah
Fatty acid[2]			Percent Fatty Acid in Lipids			
C_8:0	1.1	1.0		T[3]	T	T
C_{10}:0	3.8	2.8	2.8	5.5	1.9	2.5
C_{12}:0	30.4	23.4	27.2	20.2	27.8	20.5
C_{14}:0	14.0	12.5	13.4	10.7	12.9	13.6
C_{15}:0	T	1.9	1.7	2.4	T	T
C_{16}:0	15.9	17.3	18.0	17.4	16.6	17.9
C_{16}:1	T	3.4	3.9	3.0	4.4	3.5
C_{17}:0	T		T	T	T	
X[4]			T	T	T	
C_{18}:0	6.8	9.4	6.3	10.0	7.8	12.9
C_{18}:1	15.7	18.2	15.7	21.4	17.1	17.8
C_{18}:2	9.3	8.4	7.6	7.4	7.7	7.8
C_{18}:3	1.0	1.4	1.8	2.0	1.8	1.5
C_{20}:0	1.6	T	1.1	T	1.8	1.1
C_{22}:0	T	0.4	T	T	T	0.9
X[5]	0.2	T	0.5		0.9	T
X[6]	T	T	T		T	T

1/ All diets were cooked.

2/ An unknown saturated compound was present in most diets with the same retention time as the oleic acid and is reported as part of the oleic acid. The compound represented less than 1 percent of the total fatty acids. Several peaks were usually found after the linolenic acid peak; in most cases the total amount of these compounds would be less than 2 percent of all fatty acids and was not included in the calculations. Other odd-chain saturated fatty acids were found to a small degree in the diets and were omitted in the calculations.

3/ Trace.

4/ X = an unknown fatty acid that precedes the stearic acid peak which is tentatively indicated as a C_{18}:0 branched acid. The compound is present in most diets, but masked in many instances by the stearic acid peak.

5/ Possibly a C_{20}:4 or C_{22}:1 fatty acid.

6/ Possibly a C_{24}:0 or C_{20}:5 fatty acid.

Differences were noted in the fatty acid composition of the lipids of the individual diet composites. This was particularly noticeable in comparing the civilian diets with the military diets with respect to their myristic, lauric, stearic and oleic acid contents.

It is of interest to compare these results with those reported from Burma (36) where somewhat less fat is consumed in the diet and where peanut oil is the major fat used. The lipids of the Burmese diets contained, on the average, 32 percent saturated, 38 percent monounsaturated, and 30 percent polyunsaturated fatty acids.

Dietary Protein and Amino Acid Analyses

Methods

The evaluation of protein nutriture of a population requires consideration of both the quantity and the quality of the protein consumed. In general, this means that the problem of satisfying protein requirement is one of providing those amino acids essential to man in adequate amounts and proportions rather than a mere consideration of the quantity of protein consumed.

Information on the amino acid intakes was obtained on part of the diet composites collected. Aliquots of the diet composites (0.1-0.5 gm) were placed in Pyrex test tubes to which 5 ml of 4 N potassium hydroxide (for tryptophan analyses) or 5 ml of 4 N hydrochloric acid (for all other amino acid analyses) were added. Tubes were flushed repeatedly in a closed system with nitrogen and then sealed under vacuum. The sealed tubes were then autoclaved for 6-8 hours at 15 pounds per square inch. The hydrolyzed samples were cooled and contents evaporated to dryness in a rotary vacuum drying apparatus. The residue remaining was then dissolved in sodium citrate buffer (pH 2.2) and made to a known volume with the buffer. Following filtering, aliquots of the acid hydrolyzed samples were analyzed with a Technicon or a Beckman/Spinco amino acid analyzer.

Results

The results of the amino acid analyses of the diet composites are presented in Table 132. The protein intakes per standard man are also indicated. The amino acid values are expressed as grams of amino acid per 100 gm of protein where protein is expressed as Kjeldahl nitrogen times 6.25. Values for histidine and arginine are included in the table with recognition that these two amino acids are "essential" only for certain animal species, although histidine is essential for the human infant. Tyrosine is included because of its sparing effect on phenylalanine requirements; similarly, cystine may spare methionine.

In comparison with the FAO "provisional amino acid pattern," (37) the results of the analyses would indicate that the protein of the average Malayan diet is balanced with respect to amino acids, with the possible exception of the borderline content of methionine. However, with the observed daily protein intakes, this level of methionine in the protein would furnish the minimum requirements of the adult human. The needs for the infant or young child may not necessarily be adequately met at these levels of intake.

TABLE 132. ESSENTIAL AMINO ACID COMPOSITION OF PROTEINS IN MALAYAN DIETS[1/]

Source of diet analyzed	Protein intake per standard man per day (gm)	Isoleucine	Leucine	Lysine	Methionine	Cystine (1/2)	Phenylalanine	Tyrosine	Threonine	Valine	Histidine	Arginine
		Amino acid content (gm/100 gm of protein as N x 6.25)										
Civilians												
Kelantan	61	4.75	8.19	6.00	2.21	1.68	5.26	3.45	4.48	6.30	3.24	7.02
Kelantan	62	6.54	11.40	4.68	2.31	0.54	5.88	3.60	2.88	8.07	2.91	8.22
Pahang	88	5.25	9.66	5.94	2.16	0.30	5.46	3.00	3.12	6.48	2.34	7.98
Johore	89	4.45	7.82	5.76	1.73	1.56	4.71	1.89	3.66	5.46	3.34	5.81
Malacca	84	4.93	8.78	5.60	2.01	0.65	5.72	2.95	4.13	6.40	2.50	6.82
Perak	62	4.97	8.13	6.92	1.80	1.36	4.96	2.78	4.08	5.76	2.74	6.56
Kedah	59	4.92	7.93	6.09	1.49	1.42	5.20	2.43	4.27	6.54	2.61	5.88
Military												
Kelantan	79	3.84	6.87	5.70	1.94	1.71	5.19	2.88	4.11	6.32	2.96	5.81
Pahang	97	6.04	9.28	7.64	2.28	1.66	6.32	3.40	4.52	6.72	3.30	6.47
Johore	94	4.53	6.30	5.93	1.72	1.45	4.64	2.54	4.10	5.51	2.56	5.86
Malacca	108	3.68	7.95	7.02	1.56	1.19	4.97	2.43	3.27	5.58	2.85	5.93
Perak	97	5.02	8.63	6.40	1.94	1.71	4.98	2.94	4.30	6.21	2.52	6.47
Kedah	112	4.25	7.84	6.74	1.82	1.26	4.48	2.14	3.82	5.16	2.70	5.32
Average of all diets		4.86	8.37	6.19	1.92	1.27	5.21	2.80	3.91	6.19	2.81	6.47
FAO provisional amino acid pattern		4.2	4.8	4.2	2.2		2.8	2.8	2.8	4.2		

1/ Values for the other nonessential amino acids were determined and are available at the U.S. Army Medical Research and Nutrition Laboratory, Denver, Colorado. Tryptophan values will be published in a separate report.

Serum Vitamin B_{12} and Folacin

Methods

Although the normal daily requirements for vitamin B_{12} and folacin are not fully established, reasonable estimates of needs are known (38). Similarly, serum levels of these vitamins reflect dietary intakes. Normal human serum contains vitamin B_{12} in concentrations ranging from 0.20 to 0.90 mμg per milliliter, while folacin is present in concentrations ranging from 7.0 to 40.0 mμg per milliliter. Daily intakes in the diet of 1 to 2 μg of vitamin B_{12} and of 0.5 mg of folacin would be expected to cover nutritional needs for these vitamins.

In order to obtain preliminary information concerning the adequacy of vitamin B_{12} and folacin in the nutrition of the Malayan population sample, random serum samples and diet composites were selected for analysis for these two vitamins. The serum samples were sealed in ampules together with 10-25 mg of ascorbic acid and 1-2 ml of toluene, frozen and returned by air to the U.S. Army Medical Research and Nutrition Laboratory, Denver, Colorado.

For folacin analyses, thawed aliquots of the serum samples were diluted 1 to 10 with phosphate buffer at pH 6.1 to which fresh 0.05 percent ascorbic acid had been added. The serum-buffer solution was incubated at 37° C for 90 minutes and then autoclaved for 10 minutes at a pressure of 16 pounds per square inch. The coagulated proteins were removed by centrifugation and the clear supernatant was used for assay. Sample preparation was similar to that outlined in "Advances in Clinical Chemistry" (39). The samples were then assayed by microbiological procedures, employing Lactobacillus casei No. 7469 (American Type Culture Collection) as the assay organism. Procedures employed were those routinely used by the laboratory, and are similar to those outlined in the Official Methods of the Association of Official Agricultural Chemists (A.O.A.C., 40).

Vitamin B_{12} was extracted from the serum samples by a procedure essentially that outlined in the A.O.A.C. Official Methods (41). One milliliter of serum was mixed with 9 ml of buffer solution containing 1.3 gm of anhydrous Na_2HPO_4, 1.2 gm of citric acid monohydrate and 50 mg of sodium meta-bisulfite per 100 ml of buffer. The serum samples were autoclaved for 10 minutes at 15 pounds pressure, cooled, centrifuged, and the supernatant collected and adjusted to pH 6.6-6.8 with potassium hydroxide. The extracts were then assayed by microbiologic procedures employing Lactobacillus leichmannii No. 7830 (American Type Culture Collection).

Results

Results of the analyses of the serum for vitamin B_{12} and folacin are summarized in Table 133. Serum levels of vitamin B_{12} were normal (average of 0.53 mμg per milliliter) except for an occasional subject who was considered low. This probably reflects the adequacy of the dietary intakes of vitamin B_{12}.

TABLE 133. FOLACIN AND VITAMIN B_{12} IN THE SERUM OF RANDOMLY SELECTED MALAYAN SUBJECTS

Determination	No. of subjects analyzed	Serum content of folacin or B_{12} (mμg/ml of serum)	No. of subjects with low values	Percent of total
Folacin 1/	164	7.73	80	48.8
Vitamin B_{12} 2/	126	0.53	7	0.55

1/ *L. casei* 7469 assay; serum values below 7.0 mμg/ml were considered "low."
2/ *L. leichmannii* 7830 assay; serum values below 0.20 mμg/ml were considered "low."

Serum levels for folacin were low, with an average serum concentration of 7.73 mμg per milliliter for 164 subjects. Judging from the results of these limited studies, it would appear that additional investigations should be undertaken with regard to the adequacy of folacin (folic acid) in the diets of Malaya and its possible association with certain cases of anemia.

Vitamin B_6

The urinary excretion of vitamin B_6 was determined on urine samples collected at random, preserved with toluene at an acid pH and shipped in the dark and under refrigeration to the laboratory at the Institute for Medical Research in Kuala Lumpur. The procedure employed was measurement of the growth of a vitamin B_6-dependent organism (*Saccharomyces carlsbergensis*, American Type Culture Collection No. 9080) after the addition of aliquots of urine as compared to the growth obtained with added synthetic vitamin.1/ An excretion of less than 20 μg per gram of creatinine is considered to be indicative of a deficient intake of this vitamin.

The results of these analyses are summarized in Table 134.

TABLE 134. URINARY EXCRETION OF VITAMIN B_6, MALAYA

Sex	Military	Civilians and Military Dependents				
	Males	All children	Males	Nonpregnant, nonlactating females	Pregnant, lactating females	All subjects
Age (years)		<15	15+	15+	15+	
No. of subjects	41	68	38	36	66	189
Vitamin B_6 excretion μg/gm creatinine, Mean	18.0	48.4	22.3	43.9	40.6	35.5
			Percent Distribution			
<20 ("Deficient")	68.3	14.7	55.3	16.7	16.7	34.9
≥20 ("Acceptable")	31.7	85.3	44.7	83.3	83.3	65.1

1/ This procedure is outlined in detail in a report from the U.S. Army Medical Research and Nutrition Laboratory, Denver, Colorado, U.S.A., entitled "Vitamin and Amino Acid Assay Procedures."

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APPENDIX 1

SUGGESTED ENRICHMENT PROCEDURES FOR INCREASING INTAKES OF THIAMINE AND RIBOFLAVIN

The low level of intake of thiamine and riboflavin by the civilians studied and the generally low levels of these vitamins found by the biochemical studies suggest that riboflavin and thiamine deficiencies exist in Malaya. On the other hand, the absence of firm clinical evidence of widespread avitaminosis would seem to indicate that there was generally adequate vitamin nutrition. If the population were examined in the latter part of the monsoon season, a period of nutritional stress, clinical signs of vitamin deficiency might be more apparent.

The urgency of the need for vitamin supplementation should be decided on after a careful examination of the findings of this and other surveys.

Increased vitamin intake can be most conveniently achieved by the enrichment of normally consumed foods. Various methods of enrichment with riboflavin and thiamine are presented below, followed by a discussion of the sectors of the population that would benefit from particular types of enrichment.

<u>Enriched Rice</u>

Rice enrichment can be attained by the addition of a highly enriched rice grain (premix) to regular rice so that the final product contains the desired level of vitamins. Amounts of premix are used to obtain 4.4-8.8 ppm (parts per million) of thiamine, 2.6-5.3 ppm of riboflavin, 37-70 ppm of niacin, and 28-57 ppm of iron in the final mixture. Premix grains should be coated with a layer of protective material such as confectioner's shellac to prevent loss of vitamins during any washing that precedes cooking of the rice. The use of riboflavin in a premix produces a yellow color in the enriched grains. This may reduce the acceptability of the product since a uniform white color is considered by many Southeast Asians to denote high quality in rice. To obtain widespread use of premixed enriched rice it may be advisable to reduce the level of riboflavin in the vitamin mixture, or to exclude it entirely, in order to have a product with acceptable color characteristics.

Premix, with or without riboflavin, is available from

Thai Rice Company
691 Sathorn Road, River Bank, Bangkok
Thailand

Food Enrichment Enterprise
2219 Singalong
Manila, Philippines

Addition of premix to regular rice can be accomplished with machinery (Draver Feeders) available from

B. F. Gump & Company
431 S. Clinton Street
Chicago, Illinois
U.S.A.

The cost of the vitamins will be about \$ M 1 per 1,000 pounds of final enriched product.

Vitamin Wafers

The addition of vitamins directly to the rice during preparation is the least expensive form of supplementation. It can be readily accomplished through the use of wafers designed for addition to stated quantities of rice. The desired concentration of thiamine and riboflavin in the wafer should be determined on the basis of the number of persons fed out of a single cooking vessel. Current sources of such wafers include Merck & Company, Rahway, New Jersey, U.S.A., and Hoffmann-LaRoche, Nutley, New Jersey, U.S.A.

Fortified Condensed Milk

Vitamins may be added to canned sweetened condensed milk. Riboflavin and thiamine should be added at the rate of 2 mg per 100 gm of canned milk or 8 mg per 14 ounce can. The cost would be about \$ M 0.10 per 100 cans.

Fortified Wheat Flour

Wheat flour is an ideal carrier for supplemental vitamins. Enrichment of flour to obtain riboflavin and thiamine levels of 10 ppm would make flour a good source of these vitamins. Virtually all the wheat flour is imported in bags; therefore the enrichment should be done at the flour mill before bagging.

Flour is imported largely from Australia, although about a dozen other countries also export flour to Malaya. The protein content of Australian wheat is about 10 to 11 percent. Importation of more wheat flour of higher protein content (14 percent) from the U.S. and Canada might be a means of increasing protein intakes generally.

Diversification of the Food Supply

Larger intakes of riboflavin and thiamine would result from larger consumption of green and leafy vegetables and legumes, which are easy to raise. Other foods that are good sources of riboflavin are durian, mushrooms, bullock's heart and granadilla (passion fruit). Thiamine is high in grains, durian, bamboo shoots, garlic and pork. (The Second Five-Year Plan calls for a 50 percent increase in pork production.)

The use of enriched rice would be of the greatest benefit to the urban population. This is a group which is quite particular about the quality or color of their rice and it is very doubtful that a riboflavin-enriched rice would be popular. The enrichment of the rice milled in the innumerable small gasoline-driven mills of the countryside would be a difficult task, perhaps impossible to achieve unless the farmers themselves demanded the enrichment. These small mills supply the bulk of the rice consumed in the rural areas. The rural population would not benefit from an enrichment program unless a massive program were made to reach the small rice mills.

The use of vitamin wafers is adapted to institutional programs such as military messes, hospitals and orphanages where supervision of cooking technics is possible.

Fortified condensed milk would be of benefit to that part of the population normally consuming condensed milk. Since such fortification is simple and direct it should be put into practice even though it affects only a part of the population.

Fortified wheat flour would be of principal benefit to the Indians and to the urban population. Use of wheat products by some rural Malays in the kampongs indicates that some enrichment of the rural diet could also be achieved in this way.

APPENDIX TABLE 2. EMPL[illegible]NT IN SELECTED INDUSTRIES IN THE FEDERATION OF MALAYA, 1959 1/

		1000's of employees
Estates - Rubber		282
Coconut		7.9
Oil palm		14.6
Tea		4.0
Pineapple		2.4
Mining - Tin		21.4
Coal		0.3
Iron		4.0
Manufacturing -	Pineapple canning	1.5
	Soft drinks	1.9
	Tobacco	3.7
	Engineering	6.1
	Saw milling	6.5
	Oil milling	1.2
	Rice milling	1.9
	Printi[illegible]	3.7
	Rubber [illegible]	5.3
Transport -		27
Government -		182.3

1/ See reference (1), Chapt. V.

APPENDIX TABLE 3. EDUCATION IN THE FEDERATION OF MALAYA, 1961 1/

Total schools	5,409
Total pupils	1,322,256
Total teachers	49,177
University of Malaya	**Students**
Agriculture	53
Arts	556
Science	203
Engineering	198
Total	1,010

1/ See references (1), (2) and (8), Chapt. V.

APPENDIX TABLE 4. FOOD COMPOSITION VALUES USED IN CALCULATING MALAYAN INTAKES
(in 100 gm portions)

Food Item	Calories	Protein gm	Carbo-hydrate gm	Fat gm	Calcium mg
Cereals, bread, etc.					
Rice (home pounded)	359	7.1	78.0	1.1	14
Rice (fully milled)	360	6.7	79.0	0.7	10
Glutinous rice, E.P.2/	362	6.7	79.0	0.7	12
Rice flour, E.P.	363	7.4	79.0	0.5	(6)
Wheat flour3/	350	11.7	75.0	1.5	24
Sago flour	338	1.5	86.0	0.6	12
White bread, unenriched, E.P.	276	8.2	52.3	3.3	65
White bread, enriched3/, E.P.	276	8.2	52.3	3.3	65
Biscuits, E.P.	364	7.5	79.4	0.8	17
Biscuits, Army specification, E.P.	413	9.6	74.0	9.6	23
Protein foods (meat, fish, eggs, pulses, nuts, etc.)					
Beef, boneless	275	17.0	0	21.6	10
Beef, tinned	296	15.5	2.8	26.1	13
Stew beef, tinned (5/8 boneless)	171	11.0	0	13.5	5
Mutton, medium fat, E.P.	317	15.7	0	27.7	9
Chicken, E.P.	200	20.2	0	12.6	14
Liver, beef, E.P.	136	19.7	6.0	3.2	7.0
Liver, buffalo (see Liver, beef)					
Venison, E.P.	146	15.1	0	9	9
Fresh fish	62	8.8	--	2.7	15
Salted dry fish	125	25	--	2	38
Fresh prawns	38	6.6	2	0.8	41
Cockles, E.P.	20	3.2	3	0.4	36
Ikan bilis (anchovies)	310	62	--	5	2,480
Dry prawns, E.P.	295	62.4	1.8	2.3	247
Belachan (shrimp paste), E.P.	242	29.6	4.2	2.5	1,552
Squid, tinned	111	20.7	5.2	0.1	--
Egg (duck)	164	11.3	0.8	12.6	50
Egg (hen)	144	11.0	0.7	10.4	44
Dhall (pigeon peas)	343	20.9	59.5	1.7	29
Bean curd	58	6.3	3.1	3.1	46

1/ Names of the sources, in full, are presented at the end of this table. Numbers following the source are item numbers in source. Sources followed by (L.T.) are those recommended by Lady Thomson, Institute for Medical Research, Kuala Lumpur. Values in parentheses are imputed values.

2/ E.P. = edible portion. Unless so indicated, item is as purchased. All carbohydrate figures are E.P.

3/ For military specifications wheat flour must contain per 100 gm of flour not less than: iron 1.65 mg, thiamine 0.24 mg, nicotinic acid 1.60 mg and creta praeparata 235-390 mg. Wheat flour from United Kingdom is so enriched.

APPENDIX TABLE 4 (Continued) FOOD COMPOSITION VALUES USED IN CALCULATING MALAYAN INTAKES

(in 100 gm portions)

Iron mg	Vitamin A IU	Thia-mine mg	Ribo-flavin mg	Niacin mg	Vitamin C mg	Source 1/
1.0	(0)	0.16	0.04	2.5	(0)	F.A.O., 11 (L.T.)
0.9	(0)	0.08	0.03	1.6	(0)	F.A.O., 12 (L.T.)
0.8	(0)	0.16	--	--	(0)	U.S.D.A. No. 34, 20
(0.8)	(0)	(0.12)	(0.03)	(1.5)	(0)	U.S.D.A. No. 34, 19
2.4	(0)	0.32	0.07	1.7	(0)	F.A.O., 2
1.0	--	(0)	(0)	(1.0)	(0)	F.A.O., 38
0.6	--	0.05	0.08	0.9	0	U.S.D.A. No. 8, 134
1.8	--	0.24	0.15	2.2	0	U.S.D.A. No. 8, 138
0.5	(0)	0.03	0.03	0.7	(0)	U.S.D.A. No. 34, 38 (L.T.)
1.5	--	0.07	0.05	0.7	0	Army specifications
2.6	44	0.07	0.15	4.1	--	U.S.D.A., Armed Forces
2.6	30	0.03	0.13	1.8	--	Army specifications
1.6	27	0.05	0.10	2.7	--	Army specifications
2.4	--	0.14	0.20	4.5	0	U.S.D.A. No. 34, 246a
1.5	410	0.08	0.16	8.0	(0)	U.S.D.A. No. 34, 266a
6.6	43,900	0.26	3.33	13.7	31	U.S.D.A. No. 34, 240
1.8	(20)	0.11	0.20	5.0	0	F.A.O., 184
0.5	20	0.03	0.07	1.2	--	F.A.O., 227 (L.T.)
1.0	--	0.05	0.10	2.5	0	F.A.O., 240 (L.T.)
1.6	370	0.03	0.03	1.0	--	F.A.O., 228; M.R.C. 184
17.0	250	0.02	0.04	1.3	--	F.A.O., 229; M.R.C. 185
2.5	--	0.12	0.25	6.1	--	F.A.O., 243 (L.T.)
6.3	(210)	(0.14)	(0.43)	(6.5)	(0)	U.S.D.A. No. 34, 314
14.8	--	0.09	--	--	0	Oliveiro
--	--	--	--	--	--	Analyzed values
2.4	1,040	0.13	0.26	0.1	0	F.A.O., 217; U.S.D.A. No. 34, 319a
2.2	890	0.09	0.27	0.1	0	F.A.O., 215 (L.T.); U.S.D.A. No. 34, 321a
5.8	130	0.50	0.14	2.3	4	F.A.O., 63 1 (L.T.); Oliveiro
1.1	20	0.05	0.04	0.4	(0)	F.A.O., 57

APPENDIX TABLE 4 (Continued) FOOD COMPOSITION VALUES USED IN CALCULATING MALAYAN INTAKES
(in 100 gm portions)

Food Item	Calories	Protein gm	Carbo-hydrate gm	Fat gm	Calcium mg
Soya curd, E.P.	71	7.0	3.0	4.1	100
Ground nuts, E.P.	548	26.2	27.0	42.8	73
Green gram	340	23.9	58.0	1.3	145
Four-angled bean	27	1.9	3.1	0.2	63
Jering nut, E.P.	102	5.6	17.6	0.4	31
Vegetables					
Onions (small, red)	37	1.3	6.5	0.2	30
Lady fingers	31	1.6	7.8	0.3	66
Brinjal (eggplant)	20	1.0	5.5	0.2	12
Cucumber	10	0.6	3.2	0.1	7
Bean sprouts	32	4.2	4.5	0.7	38
Cabbage	17	1.1	5.3	0.1	35
Kankong (dark leaves)	22	2.4	4.9	0.3	131
Bayam (Amaranth, dark leaves)	22	2.4	4.9	0.3	131
Sawi (light) (mustard greens)	18	1.5	5.1	0.1	41
Fern shoots	18	1.5	3.5	0.1	41
Long green beans	32	2.2	6.9	0.2	52
String beans, tinned	18	1.0	4.2	0.1	27
Bamboo shoots, E.P.	27	2.6	5.2	0.3	13
Tapioca shoots	18	1.5	5.1	0.1	41
Sweet potato tops	18	1.5	5.1	0.1	41
Lobak	19	1.0	4.2	0.1	33
Tomato, green, red, E.P.	20	1.0	4.0	0.3	11
Red chillies (fresh)	28	1.2	6.0	0.2	7
Green chillies (fresh)	19	1.0	6.0	0.2	5
Dry chillies, E.P.	246	12.6	37.7	4.5	159
Bitter gourd, E.P.	29	1.1	6.6	0.3	45
Tapioca	109	0.9	32.7	0.2	25
White potato	70	1.7	17.0	0.1	7
Potato, tinned	58	1.7	13.0	--	8
Sweet potato	97	1.1	23.7	0.3	28
Fruits					
Rambutan, E.P.	63	0.8	14.5	0.1	25
Papaya, E.P.	39	0.6	10.0	0.1	20
Banana	71	0.8	23.0	0.3	6

1/ Insufficient data.

APPENDIX TABLE 4 (Continued) FOOD COMPOSITION VALUES USED IN CALCULATING MALAYAN INTAKES
(in 100 gm portions)

Iron mg	Vitamin A IU	Thiamine mg	Riboflavin mg	Niacin mg	Vitamin C mg	Source
1.5	--	0.06	0.05	0.4	(0)	U.S.D.A. No. 34, 174
1.8	--	1.09	0.13	15.6	--	U.S.D.A. No. 34, 222a
7.8	300	0.56	0.17	2.0	5	F.A.O., 63f; Oliveiro
1.3	890	0.06	0.12	0.5	22	Oliveiro
9.9	(0)	(0.10)[1/]	( )[1/]	( )[1/]	( )[1/]	Oliveiro
0.5	50	0.03	0.04	0.2	8	F.A.O., 77 (L.T.); Oliveiro
1.1	320	0.08	0.06	0.9	18	F.A.O., 99a
0.3	25	0.03	0.04	0.5	4	F.A.O., 111; Oliveiro
0.2	--	0.02	0.03	0.1	6	F.A.O., 110 (L.T.); Oliveiro
1.0	170	0.21	0.42	1.0	14	F.A.O., 86a (L.T.)
0.3	70	0.04	0.03	0.2	35	F.A.O., 91 (L.T.); U.S.D.A. No. 34, 118a
2.3	4,730	0.07	0.15	0.6	55	F.A.O., 106a (L.T.)
2.3	4,730	0.07	0.15	0.6	55	F.A.O., 106a (L.T.)
0.8	670	0.04	0.06	0.3	31	F.A.O., 106b (L.T.)
0.8	670	0.04	0.06	0.3	31	F.A.O., 106b
0.7	570	0.07	0.01	0.4	17	F.A.O., 86 (L.T.);U.S.D.A. No. 34, 110-B
1.4	410	0.03	0.04	0.3	4	U.S.D.A. No. 8, 51
0.5	20	0.15	0.07	0.6	4	U.S.D.A. No. 34, 106a
0.8	670	0.04	0.06	0.3	31	F.A.O., 106b
0.8	670	0.04	0.06	0.3	31	F.A.O., 106b
0.6	10	0.03	0.02	0.4	30	F.A.O., 80
0.6	1,100	0.06	0.04	0.5	23	U.S.D.A. No. 34, 184a
0.7	770	0.07	0.07	0.8	89	F.A.O., 103; M.R.C., 115
0.7	240	0.03	0.04	0.7	84	F.A.O., 102; M.R.C., 115
2.1	575	0	--	--	39	Oliveiro
1.4	180	0.08	0.03	0.4	52	Oliveiro
0.5	--	0.04	0.02	0.4	27	F.A.O., 37 (L.T.); M.R.C., 34; Oliveiro
0.6	--	0.08	0.03	1.2	8	F.A.O., 34 (L.T.); M.R.C., 39
0.5	--	0.06	0.03	0.8	9	Army specifications
0.8	420	0.08	0.04	0.5	19	F.A.O., 36 (L.T.); Oliveiro
3.0	0	0	( )[1/]	( )[1/]	48	Oliveiro
0.3	1,750	0.03	0.04	0.3	56	U.S.D.A. No. 34, 77a
0.4	180	0.03	0.03	0.5	9	F.A.O., 119 (L.T.); Oliveiro

APPENDIX TABLE 4 (Continued) FOOD COMPOSITION VALUES USED IN CALCULATING MALAYAN INTAKES

(in 100 gm portions)

Food Item	Calories	Protein gm	Carbo-hydrate gm	Fat gm	Calcium mg
Pineapple	30	0.3	13.7	0.1	12
Durian, E.P.	144	2.5	30.4	3.1	9
Tamarind, E.P.	265	2.6	64.0	0.4	170
Oils and fats					
Coconut oil	884	--	--	100.0	--
Margarine	720	0.6	0.4	81.0	20
Margarine, tinned	720	0.6	0.4	81.0	20
Ghi	804	--	0	91.5	tr
Sugars and sweets					
Sugar, granulated	385	(0)	99.5	(0)	--
Sugar, brown	370	(0)	95.5	(0)	76
Egg jam	377	4.2	81.1	3.9	38
Pineapple jam	214	2.2	51.2	0.1	--
Jams, miscellaneous	278	0.5	70.8	0.3	12
Miscellaneous items					
Lemonade, powdered	355	--	90.0	--	--
Milk, evaporated	138	7.0	9.9	7.9	243
Shredded fresh coconut, E.P.	359	3.4	14.0	34.7	21
Coconut milk (santan)	153	1.6	3.0	14.9	0.22
Coconuts	161	1.9	3.2	15.6	4
Garlic, E.P.	95	4.5	23.1	0.2	42
Soya sauce	46	5.7	9.0	1.3	123.
Vinegar	12	0	(5.0)	--	7
Curry powder	212	9.5	23.5	10.8	637
Coriander seed	272	10.9	55.7	0	628
Ginger, fresh, E.P.	51	1.5	10.1	1.0	21

1/ Insufficient data. 2/ Differs from amount given in reference.

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APPENDIX TABLE 4 (Continued) FOOD COMPOSITION VALUES USED IN CALCULATING MALAYAN INTAKES

(in 100 gm portions)

Iron mg	Vitamin A IU	Thia-mine mg	Ribo-flavin mg	Niacin mg	Vitamin C mg	Source
0.3	60	0.05	0.02	0.1	26	F.A.O., 153; Oliveiro
0.9	30	0.24	0.20	0.7	24	U.S.D.A. No. 34, 47a (L.T.)
11.0	100	0.07	( )1/	( )1/	10	Oliveiro
--	--	--	--	--	--	U.S.D.A. No. 34, 348
0	2,716 2/	--	--	--	--	U.S.D.A. No. 34, 345 (+2,000 IU vitamin D)
0	2,716 2/	--	--	--	--	U.S.D.A. No. 34, 345 (+111 IU vitamin D)
--	1,900	--	--	--	--	U.S.D.A. No. 34, 343
--	(0)	(0)	(0)	(0)	(0)	U.S.D.A. No. 34, 352
2.6	(0)	(0)	(0)	(0)	(0)	U.S.D.A. No. 34, 351
1.4	--	--	--	--	--	Oliveiro
--	--	--	--	--	8.2	Analyzed values
0.3	10	0.02	0.02	0.2	6	U.S.D.A. No. 8, 353
--	--	--	--	--	65	Army specifications
0.2	400	0.05	0.36	0.2	1	U.S.D.A. No. 34, 335
2.0	0	0.10	0.01	0.2	2	U.S.D.A. No. 34, 219a
0.8	--	0.02	0.01	0.1	0	Analyzed values
0.8	--	0.03	0.01	0.3	1	F.A.O., 64
1.0	tr	0.22	0.08	0.4	15	U.S.D.A. No. 34, 139a
5.7	0	--	--	--	0	U.S.D.A. No. 34, 203
0.5	--	--	--	--	--	U.S.D.A. No. 34, 362
75.0	9,000	0.10	0.32	4.4	133	Oliveiro
17.6	0	0	( )1/	0	0	Singapore tables
1.6	30	0.02	( )1/	0.8	4	Singapore tables

APPENDIX 5. OUTLINE OF QUESTIONS USED IN HOME DIETARY STUDY, MALAYA NUTRITION SURVEY, 1962

General questions

1. Did you accompany the woman to market during the home visit?
2. What time of the day is marketing usually done, if it is done?
3. List the foods (in this home) that are purchased daily (i.e., fresh produce).
4. List the foods (in this home) that are purchased Weekly _____ Monthly _____
5. List the foods (in this home) that are home-produced (include fish).
6. List any food that you observe during the home visit to be seasonal in this area.
7. If any food is either not available or not used by this family because it is seasonal at this time, state what it is.
8. Is the noon or mid-day meal larger than the supper or night meal, or vice versa?
9. Is the night meal followed by activity or work?

Food preparation practices

Rice

1. Is it washed before cooking?
2. For approximately how long is it cooked?
3. How is it cooked?
4. How much water is used in cooking (little, moderate, much)?
5. In what kind of utensil is it cooked?
6. Is anything added before or during cooking (i.e., salt, etc.)?
7. How is the rice used after cooking?

Fish

1. By what method(s) is fish cooked?
2. If more than one method is used, which one is generally used?
3. If fish was cooked during the home visit, what method was used?
4. How long was the fish cooked?
5. What utensil was used for cooking?
6. How was it served (alone, in soup, etc.)?

Meat

1. When meat is used, how is it cooked?
2. Which cooking method is usually used?
3. If meat was cooked during the home visit, how was it cooked?
4. If there was any preliminary preparation of the meat before cooking, , describe briefly (i.e., soaking, washing, etc.).
5. What utensil was used to cook the meat?
6. How long was it cooked?

Other protein foods

1. If other protein foods were cooked during the home visit (i.e., eggs, pulses, etc.), what were they?
2. How were they cooked?
3. In what utensil?
4. For how long?
5. If they received special preparation, describe.

Vegetables
1. How were they prepared for cooking?
2. If water was used in cooking them, how much was used?
3. By what methods were they cooked?
4. For how long (approximately)?
5. Were they served separately or combined with other foods?
6. Make any additional comments.

Fruits
1. How were they eaten (raw or cooked)?
2. Were they washed, etc.?
3. How were they cooked?
4. For how long?
5. In what utensils?

Other foods
1. What foods were prepared during the home visit, other than those included in this form (for example, lentils, pulses, etc.)?
2. Note below how these foods were prepared, cooked, length of cooking time, and served. (Write this information on the back of this page.)

APPENDIX 6. DIETARY QUESTIONNAIRE FORM, MALAYA, 1962

SURVEY RECORD NO: ______________________________ DATE ____________________

STATE ____

KAMPONG (town, etc.) ____________________

MEMBERS OF HOUSEHOLD:

No.	Name	Kinship	Sex	Age	Occupation	Income per month

TOTAL NUMBER IN HOUSEHOLD ________________

OTHERS NOT AT HOME, SUPPORTED
BY FAMILY INCOME ____

PROPERTY:

House: ____

Land: ____

Others: ____

SURVEY RECORD NO: ____________________

MOTHER (Woman of child-bearing age) (Name and number from household list on page 1.)

Kampong of origin: ____________________

Married - number of years: ____________________

Widowed/divorced: ____________________

Number of children: ____________________

Alive Dead (give cause)

MOTHER:

Sensible:	___	___	___	___	___	Yes/No
Literate:	___	___	___	___	___	Yes/No
Alert:	___	___	___	___	___	Yes/No
Tidy:	___	___	___	___	___	Yes/No
Frequent illness:	___	___	___	___	___	Yes/No
Co-operative:	___	___	___	___	___	Yes/No
Attendance at Maternal and Child Health Center	___	___	___	___	___	Yes/No

CUSTOMARY DIET:

Antenatal: ____________________

Confinement: ____________________

Postnatal: ____________________

Any other customs during these times: ____________________

APPENDIX 6 (Continued) DIETARY QUESTIONNAIRE FORM, MALAYA, 1962

- 3 -

Location Code No.:

Name:

What foods did your family eat yesterday:

(State the day of the week)

Meals (write in time of meal also)	Menu items	Food item	Amount	P1/	H1/	F1/
In between meals						

1/ P = purchased
H = home-grown or -gathered
F = free gift or supplement

APPENDIX 6 (Continued)

SURVEY RECORD NO: ______________________

HOME CONDITIONS: ______________________

HOUSE:

Rented: ______________________ Rent per month: ____________

Structure (wood, etc.): ______________________

Size and no. of rooms: ______________________

Furniture (adequate or not): ______________________

Water supply (piped/well/river/other): ______________________

Kitchen facilities (stove - utensils): ______________________

CLEANLINESS:

House: ______________________

Compound: ______________________

LIVESTOCK:

Poultry: ______________________

Goats: ______________________

Cattle: ______________________

COMMUNICATIONS:

Accessibility - Road: ______________________

Path: ______________________

River: ______________________

SHOPS (Distance away):

Malay: ______________________

Chinese: ______________________

Indian: ______________________

MARKET: Distance: ______________ Weekly/daily: ____________

TRAVELING SALESMAN: Weekly/daily: ______________________

Availability of sea or other fish (price high or low): ____________

LOCALE:

Type of area: ______________________

Fertility: ______________________

Floods (frequency): ______________________

REMARKS:

Influence of older members of household, etc.

Any other points mentioned during questioning that are considered of interest.

APPENDIX TABLE 7. STANDARD MAN VALUE[1/]

	Age Groups (years)	
Children	Younger than one year	0.25
	1-3	0.35
	4-6	0.50
	7-9	0.65
	10-12	0.75
Boys	13-15	1.00
Girls	13-15	0.75
Boys	16-19	1.20
Girls	16-19	0.70
Men	20-59	1.00
	60+	0.75
Women	20-59	0.80
	60+	0.55
	Pregnant or lactating	1.00

1/ As proportion of standard man.

APPENDIX TABLE 8. GOVERNMENT REVENUE AND EXPENDITURES, FEDERATION OF MALAYA[1/]

Revenue Item	M $ Million	Expenditure Item	M $ Million
Export duties	166	Defense	176
Import duties	339	Medical and health	87
Excise	7	Social welfare	4
Licenses	59	Education	189
Inland revenue	211	Public works	33
Government services	28	Posts and telecoms	36
Commercial undertakings	50	Administration	368
Rent and interest	43	Allocations to States	62
Miscellaneous	63		
Total	970		957
Rubber export duty	100		
Tin export duty	57		
Alcoholic beverage import	38		
Tobacco import	100		
Petrol import	86		

1/ See reference (1).

APPENDIX TABLE 9. TRANSPORTATION IN THE FEDERATION OF MALAYA

Railways, 1961 1/

Passengers carried	7,535,000	
Goods carried	464,202	(1,000 ton-miles)
Track mileage, 1959	1,305	

Roads 2/

	Miles
Bituminous	2,053
Hardened	1,100
- - - - - - -	
State roads	4,418
Federal roads	2,511
Total roads	6,930

Motor Vehicles, 1962 3/

Private motor cycles	75,873
Private motor cars	107,349
Buses	3,012
Taxis	4,478
Hire and drive cars	49
Lorries and vans	32,314
Road rollers, trailers, etc.	10,099
Total vehicles	233,174

1/ See reference (1).
2/ See reference (2).
3/ See reference (3).

APPENDIX TABLE 10. LAND USE IN THE FEDERATION OF MALAYA, 1961 1/

Crop	Acres	Production (long tons)
Rubber	3,500,000	736,170
Oil palm	141,000	93,350
Coconut	520,000	87,370
Rice	953,000	605,000
Tea	9,000	2,900
Coffee	16,700	
Fruits	214,000	
Spices	46,000	
Food crops	129,000	
Miscellaneous	64,000	

1/ See reference (3).

APPENDIX TABLE 11. EXTERNAL TRADE, FOOD AND AGRICULTURE, FEDERATION OF MALAYA, 1961 1/

Commodity	Import	Export
	M $ Million	
Live animals for food	12.5	0.6
Meat and meat preparations	15.8	0.3
Milk and cream	69.3	1.0
Other dairy products	33.7	1.4
Fish and fish preparations	29.0	17.8
Rice	129.5	8.7
Wheat flour	37.9	0.3
Other cereals and cereal products	24.3	2.0
Fruits and vegetables	65.1	48.7
Sugar and sugar preparations	68.5	0.6
Coffee, tea, spices, etc.	33.6	23.3
Beverages	39.4	0.4
Oil seeds, etc.	28.5	26.2
Animal and vegetable oils	13.5	89.5
Feeding stuffs for animals	29.2	0.3
Crude fertilizer	11.8	0.5
Manufactured fertilizer	27.9	0.1
Live animals not for food	2.6	1.2
Salt	2.1	0.02

1/ See reference (4).

APPENDIX TABLE 12. RICE ACREAGES AND PRODUCTION, FEDERATION OF MALAYA, 1960-1961 SEASON 1/

State	Areas planted (acres)		Rice production (long tons)	
	Wet	Dry	Wet	Dry
Johore	9,640	--	5,110	--
Kedah	282,270	1,780	223,740	480
Kelantan	163,860	17,250	73,860	7,860
Malacca	31,620	--	21,060	--
Negri Sembilan	32,410	--	23,400	--
Pahang	41,460	790	14,080	110
Penang and Province Wellesley	39,240	100	25,570	40
Perak	116,680	1,140	77,580	320
Perlis	63,130	--	44,760	--
Selangor	49,750	--	44,290	--
Trengganu	49,240	9,140	19,140	2,420
Total	879,300	30,200	572,590	11,230

1/ See reference (5).

APPENDIX TABLE 13. RICE PRODUCTION AND IMPORTS, FEDERATION OF MALAYA[1/]

Year	Total planted (1,000 acres)	Rice production (1,000 long tons)	Rice imported (1,000 long tons)
1955	891	411	347
1956	876	420	362
1957	897	488	340
1958	909	495	346
1959	924	443	359
1960	941	561	356
1961	953	605	315

1/ See reference (1).

APPENDIX TABLE 14. AVERAGE RETAIL FOOD PRICES, FEDERATION OF MALAYA, 1961[1/]

	M $
Rice, Siam (catty)	.33
Rice, Kedah No. 2 (catty)	.26
Rice, parboiled (catty)	.28
Rice, glutinous (catty)	.30
Wheat flour (catty)	.24
Bee hoon (catty)	.38
Bread (lb)	.26
Biscuit, local (catty)	.48
Dhall (catty)	.30
Peas, dried (catty)	.30
Coconut (nut)	.19
Fresh vegetables (catty)	.20-.50
Chillies (catty)	.40-1.00
Bananas (catty)	.23
Beef and buffalo meat (catty)	1.90-2.10
Goat meat (catty)	2.80
Pork (catty)	1.52
Hen (catty)	1.74
Duck (catty)	1.20
Fish, kurau (catty)	2.30
Fish, merah (catty)	.51
Fish, parang	1.12
Fish, kembong	.55
Fish, tengiri	1.23
Fish, chencharu	.72
Crabs	.75
Cockles (catty)	.17
Fowl eggs (each)	.13
Condensed milk (14 oz tin)	.65
Coconut oil (qt)	.63
Ghi (lb)	2.08
Salt (catty)	.08

1/ See reference (1).

APPENDIX 15

GLOSSARY OF MALAY TERMS

Catty (kati)	1-1/3 pounds
Picul	133 pounds
Gantang	1 gallon

Babi	Pig	Kampong	Village
Beras	Rice, uncooked	Kebun	Garden
Buah	Fruit	Kelapa kering	Copra
Buah pinggang	Kidney	Kerbau	Buffalo
Busi, dedak	Rice bran	Lembu	Cow, ox
Cheleng	Pig	Nasi	Rice, cooked
Daging	Meat	Padi (paddy)	Rice, growing or unmilled
Dusun	Orchard		
Garam	Salt	Ragi	Yeast
Gula	Sugar	Roti	Bread
Hati	Liver	Rimpi	Dried banana
Ibau	Edible muscle	Sayor	Vegetable
Ikan	Fish	Susu	Milk
Itek	Duck	Telor	Egg
Kambing	Goat	Tulang	Bone

<u>Fish</u>

Ikan bilis	Anchovy	Ikan tamban	Sardine
Ikan ayer	Bonito	Ikan tenggiri	Spanish mackerel
Ikan aruan	Snakehead	Kerang	Cockle
Ikan gelama	Jew fish	Ketam	Crab
Ikan kembong	Chub mackerel	Udang	Shrimp
Ikan keli	Catfish	Udang baring	Small shrimp
Ikan merah	Red snapper	Belachan	Shrimp paste
Ikan parang	Dorab	Budu	Fish sauce
Ikan selayang	Scad	Chinchalo	Pickled shrimp
Ikan talang	Queen fish		

APPENDIX 16

EDIBLE PLANTS, FEDERATION OF MALAYA

Name		
Malayan	**English**	**Scientific**
Chiku	Sapodilla	Achras zapota
Duku		Lansium domesticum
Langsat		Lansium domesticum
Rambutan	Rambutan	Nephelium lappaceum
Mangosteen	Mangosteen	Garcinia mangostana
Durian	Durian	Durio zibethinus
Sukun	Breadfruit	Artocarpus communis (Burkill)
Buah susu	Passion fruit or granadilla	Passiflora spp.
Bayam	Amaranth	Amaranth spp.
Tembikai	Watermelon	Citrullus vulgaris B.
Kangkong	Leafy vegetable	Ipomoea aquatica
Labu merah	Muskmelon	Cucurbita moschata
Limau manis	Mandarin orange	Citrus reticulata
Limau nipis	Lime	Citrus acida
Lobak merah	Carrot	Daucus carota
Lobak	Chinese radish	Raphanus caudatus
Kachang tanah	Peanut	Arachis hypogaea
Kachang bendi	Okra	Hibiscus esculentus
Kachang serendeng	Lima bean	Phaseolus lunatus
Kachang bunchis	French bean	Phaseolus vulgaris
Kachang panjang	Long bean	Vigna sesquipedalis
Kachang kayu	Indian dahl	Cyanus indicus
Kachang merah	Red gram	Cajanus cajan
Kachang puteh	Peas	Pisum sativum
Kachang hijan	Mung bean	Phaseolus aureus
Kachang hitam	Black gram	Phaseolus mungo
Timun	Cucumber	Cucumis sativus
Terong	Eggplant	Solanum melongena
Jambu batu	Guava	Psidium guajava
Sawi	Leaf mustard	Brassica juncea
Bayam	Spinach	Spinacia oleracea
Nanas	Pineapple	Ananas comosus
Buah betek	Papaya	Carica papaya
Jagong	Maize	Zea mays
Keledek	Sweet potato	Ipomoea batatas
Pisang	Banana	Musa paradisiaca
Haliah	Ginger	Zingiber officinale
	Taro	Colocasia spp.
Bakek	Pepper (spice)	Piper chaba
Beremi	Native water cress	Herpestes monniera
Berohi	Arrowroot	Maranta arundinacea
Beruas	Wild mangosteen	Garcinia spp.
Pala	Nutmeg	Myristica fragrans
Champedak; Nangka	Jak fruit	Artocarpus polyhema
Chengkeh	Clove	Eugenia caryophylla

APPENDIX 16 (Continued)

EDIBLE PLANTS, FEDERATION OF MALAYA

Name		
Malayan	English	Scientific
Chermai		Phyllanthus districtous
Chabai; Chili	Red pepper	Capsicum minimum
Lada	Sweet pepper	Capsicum frutescens
Bawang	Onion	Allium cepa
Sagu	Sago	Metroxylon spp.
Gandum	Wheat	Triticum vulgare
Asam gelugar		Garcinia atroviridis
Janggus	Cashew	Anacardium occidentale
Jarak	Castor oil plant	Ricinus communis
Jelai	Millet	Aphania paucijuga
Jerok	Citrons	Citrus medica
Jintan	Caraway	Carum carvi
Buah nona	Bullock's heart or custard apple	Annona reticulata
Sri kaya	Sweetsop or sugar apple	Annona squamosa
Kayu manis	Cinnamon	Cinnamomum spp.
Pokok nyiur; Pokok kelapa	Coconut tree	Cocos nucifera
Petola hutan	Towel gourd	Luffa acutangula
Pinang	Areca nut	Areca catechu
Ramunggai	Horseradish tree	Moringa pterygosperma
Rumbia	Sago palm	Metroxylon sagu
Saga	Indian red pea	Adenanthera pavoniva
Sekoi	Italian millet	Setaria italica
Sentol	Santol (a fruit)	Sandcricum indicum
Sepam	Wild mango	Mangifera foetida
Rambai		Baccautea motkyana
Tampoi	(A fruit)	Baccautea malayana
Ubi benggala	Potato	Solanum tuberosum
Ubi karu	Tapioca	Manihot utilissima
Ubi nasi	Yam	Dioscorea alata
Petai	Nittatree	Parkia biglobosa
Kabong	Sugar palm (a palm fruit)	Arenga saccharifera

APPENDIX TABLE 17. AGE DISTRIBUTION AND TIME IN SERVICE BY LOCATION, MILITARY, MALAYA

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
Number examined	201	150	101	50	85	271	200	210	1,268
					Percent Distribution				
Age (years)									
18	--	--	--	--	--	--	12.5	--	2.0
19	--	--	--	--	--	0.7	30.0	0.5	5.0
20-24	29.4	29.3	38.6	4.0	41.2	39.1	57.5	50.5	39.9
25-29	40.8	37.3	35.6	38.0	35.3	32.5	--	35.2	30.4
30-34	22.9	24.7	17.8	40.0	18.8	22.5	--	10.0	1[illegible].3
35-39	6.5	8.7	7.9	18.0	3.5	4.8	--	3.8	5.3
40+	0.5	--	--	--	1.2	0.4	--	--	0.2
Time in Service									
0-30 days	--	--	8.9	--	--	1.8	1.0	2.4	1.6
1-4 months	--	--	5.0	4.0	--	1.1	99.0	12.8	18.5
5-11 months	--	0.7	3.0	4.0	1.2	4.0	--	6.2	2.4
1-2 years	3.0	4.7	11.9	--	5.9	2.6	--	13.8	5.2
3-4 years	15.4	13.3	3.0	--	16.5	18.1	--	17.1	12.1
5-7 years	24.4	23.3	20.8	12.0	29.4	23.2	--	9.5	17.3
8-12 years	38.3	36.0	40.6	46.0	38.8	33.2	--	23.8	29.0
13-20 years	18.4	22.0	6.9	34.0	8.2	15.9	--	14.3	13.7
21-30 years	0.5	--	--	--	--	--	--	--	0.1

APPENDIX TABLE 18. LOCATION AND AREA OF ORIGIN OF MALAYAN MILITARY MEN RECEIVING ABBREVIATED EXAMINATIONS

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
Number examined	201	150	101	50	85	271	200	210	1,268
Area of Origin				Percent Distribution					
Selangor	3.0	2.0	6.9	18.0	11.8	3.7	22.0	7.1	8.2
Kelantan	8.4	9.3	9.9	4.0	7.0	4.8	0.5	3.3	5.5
Pahang	7.5	2.0	4.0	--	--	5.2	1.0	2.8	3.5
Johore	11.4	10.7	5.9	6.0	14.1	19.6	18.0	11.4	13.6
Malacca	37.8	31.3	30.7	40.0	23.5	31.4	39.0	28.6	32.9
Perak	18.4	25.3	24.8	22.0	25.9	18.8	16.5	30.5	22.2
Kedah	5.5	8.7	8.9	8.0	12.9	5.9	1.0	6.2	6.2
Trengganu	1.5	3.3	1.0	--	1.2	4.4	0.5	--	1.8
Penang	2.0	6.0	6.9	2.0	1.2	3.3	1.5	3.3	3.2
All others	4.5	1.3	1.0	--	2.4	3.0	--	6.7	2.8

APPENDIX TABLE 19. PERCENT "STANDARD WEIGHT" BY AGE, ABBREVIATED EXAMINATIONS, MILITARY, MALAYA

Age (years)	18	19	20-24	25-29	30-34	35-39	40+	Total
Number examined	25	63	505	385	219	67	3	1,267
Mean	89.0	89.5	90.5	94.5	96.0	98.0	104.0	93.0
S.E.1/	1.28	0.81	0.34	0.55	0.80	1.71	9.30	0.29
				Percent Distribution				
70-79	8.0	1.6	4.0	3.6	1.8	6.0	--	3.6
80-89	40.0	60.3	47.9	38.2	36.1	23.9	--	42.0
90-99	48.0	33.3	37.4	30.1	33.3	34.3	66.7	34.4
100-109	4.0	3.2	9.1	19.5	15.5	11.9	--	13.1
110+	--	1.6	1.6	8.6	13.2	23.9	33.3	6.9

1/ S.E. = standard error.

APPENDIX TABLE 20. SKINFOLD THICKNESS BY AGE, MILITARY, MALAYA

Age (years)	18	19	20-24	25-29	30-34	35-39	Total
Arm (mm)							
Number	6	22	97	82	46	13	266
Mean	6.5	8.0	7.6	8.5	7.9	9.5	8.0
Scapula (mm)							
Number	6	22	97	82	46	13	266
Mean	10.7	9.6	11.2	12.5	14.3	15.4	12.2

APPENDIX TABLE 21. ABBREVIATED CLINICAL FINDINGS BY AGE, MILITARY, MALAYA

Age (years)	18	19	20-24	25-29	30-34	35-39	40+	Total
Number examined	25	63	506	385	219	67	3	1,268
				Percent Prevalence				
Skin, Face and Neck								
Nasolabial seborrhea	12.0	7.9	14.2	10.1	11.4	6.0	--	11.7
Lips								
Angular lesions	4.0	1.6	1.0	0.5	--	--	--	0.7
Angular scars	8.0	--	1.6	1.8	1.8	7.5	--	2.0
Cheilosis	--	--	0.2	--	--	--	--	0.1
Gums								
Swollen red papillae - Localized	4.0	4.8	4.5	5.2	6.4	10.4	--	5.4
Diffuse	28.0	14.3	8.1	7.3	12.8	10.4	33.3	9.5
Tongue								
Filiform papillary atrophy - Slight	--	1.6	1.6	0.2	1.4	1.5	--	1.1
Moderate	--	--	--	--	0.4	--	--	0.1
Glossitis	--	--	--	--	0.9	--	--	0.2
Magenta colored	--	--	0.2	0.5	0.9	1.5	--	0.5
Glands								
Thyroid enlarged - Grade I	--	1.6	0.2	0.5	1.4	1.5	--	0.6
Skin, General								
Follicular hyperkeratosis - Anywhere	--	--	2.2	0.2	--	--	--	0.9
Arms	--	--	0.6	--	--	--	--	0.2
Back	--	--	1.8	0.2	--	--	--	0.8
Thighs	--	--	0.2	--	--	--	--	0.1
Lower Extremities								
Loss of ankle jerk - Unilateral	4.0	--	0.4	0.8	0.4	1.5	--	0.6
Bilateral	--	4.8	1.8	1.6	1.4	3.0	--	1.8
Calf tenderness	--	--	--	0.2	0.4	--	--	0.2

APPENDIX TABLE 22. CLINICAL FINDINGS BY LOCATION, DETAILED EXAMINATIONS, MILITARY, MALAYA

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
Number examined	40	30	25	10	18	54	50	42	269
<u>Eyes</u>									
Thickened opaque bulbar conjunctivae	17.5		4.0				28.0	19.0	11.2
Pingueculae	5.0	100.0	16.0	30.0	66.7	63.0	2.0		32.0
Bitot's spots					5.6				0.4
Conjunctival injection	7.5				5.6	3.7	4.0		3.0
<u>Skin, Face and Neck</u>									
Nasolabial seborrhea	25.0	3.3	28.0	30.0	22.2	13.0	20.0	38.1	21.6
Other seborrhea							12.0	11.9	4.1
<u>Lips</u>									
Angular lesions						3.7			0.7
Angular scars		56.7				3.7	2.0		7.4
<u>Gums</u>									
Marginal redness	57.5						60.0	47.6	27.1
Marginal swelling	65.0						68.0	47.6	29.7
Atrophy of papillae	50.0		4.0			1.8	2.0	9.5	10.0
Recession	52.5	6.7	16.0	20.0		7.4	22.0	26.2	20.4
Swollen red papillae									
Localized	15.0	23.3			5.6	20.4	8.0	4.8	11.5
Diffuse		36.7	4.0		22.2	5.6	20.0	4.8	11.5
<u>Tongue</u>									
Filiform papillary atrophy									
Slight						1.8	4.0		1.1
Fungiform papillary atrophy									
Slight			4.0						0.4
Moderate							2.0		0.4
Papillary hypertrophy									
Slight							2.0		0.4
Geographic		3.3			5.6		6.0	2.4	2.2
Furrows	15.0	6.7	4.0	10.0	5.6		10.0		5.9
Fissures	2.5		8.0						1.1
Serrations								2.4	0.4
Red tip and/or lateral margins		3.3			16.7		2.0		1.8
<u>Glands</u>									
Thyroid enlarged							2.0		0.4
<u>Skin, General</u>									
Follicular hyperkeratosis									
Anywhere	12.5				5.6	3.7	2.0	16.7	5.9
Arms, slight								2.4	0.4

APPENDIX TABLE 22 (Continued) CLINICAL FINDINGS BY LOCATION, DETAILED EXAMINATIONS, MILITARY, MALAYA

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
Number examined	40	30	25	10	18	54	50	42	269
Skin, General (Continued)									
Back, slight	5.0				5.6	1.8	2.0	9.5	3.3
Moderate/severe						1.8		4.8	1.1
Chest, slight	10.0						2.0	7.1	3.0
Moderate/severe								2.4	0.4
Perifolliculosis							4.0		0.7
Dry skin							28.0		5.2
Acneform eruption					5.6	1.8	6.0		1.8
Lower Extremities									
Loss of ankle jerk									
Bilateral		3.3	4.0		11.1	3.7			2.2
Loss of knee jerk									
Bilateral	2.5				11.1				1.1

APPENDIX TABLE 23. DETAILED CLINICAL FINDINGS BY TIME IN SERVICE, MILITARY, MALAYA

Time in Service	0-30 days	1-4 months	5-11 months	1-2 years	3-4 years	5-7 years	8-12 years	13-20 years	Total
Number examined	11	57	5	10	30	33	89	34	269
				Percent Prevalence					
Eyes									
Thickened opaque bulbar conjunctivae	--	24.6	--	--	10.0	3.0	11.2	5.9	11.2
Pingueculae	27.3	1.8	--	10.0	26.7	42.4	47.2	50.0	32.0
Bitot's spots	--	--	--	--	3.3	--	--	--	0.4
Conjunctival injection	--	3.5	--	--	--	--	4.5	5.9	3.0
Skin, Face and Neck									
Nasolabial seborrhea	18.2	22.8	20.0	50.0	23.3	18.2	21.3	14.7	21.6
Other seborrhea	18.2	10.5	--	10.0	6.7	--	--	--	4.1
Lips									
Angular lesions	9.1	--	--	10.0	--	--	--	--	0.7
Angular scars	9.1	1.8	--	--	6.7	6.1	6.7	23.5	7.4
Gums									
Marginal redness	9.1	54.4	--	30.0	23.3	18.2	20.2	20.6	27.1
Marginal swelling	9.1	61.4	--	50.0	26.7	21.2	20.2	17.6	29.7
Atrophy of papillae	--	1.8	--	--	13.3	15.2	13.5	14.7	10.0
Recession	18.2	19.3	20.0	10.0	13.3	21.2	27.0	14.7	20.4
Swollen red papillae - Localized	--	7.0	20.0	--	10.0	18.2	12.4	17.6	11.5
Diffuse	18.2	17.5	--	--	10.0	9.1	7.9	17.6	11.5
Tongue									
Filiform papillary atrophy									
Slight	--	3.5	--	--	--	--	1.1	--	1.1
Fungiform papillary atrophy									
Slight	--	--	--	--	--	--	--	2.9	0.4
Moderate	--	1.8	--	--	--	--	--	--	0.4
Papillary hypertrophy - Slight	--	1.8	--	--	--	--	--	--	0.4
Geographic	--	5.3	--	--	6.7	--	--	2.9	2.2
Furrows	--	8.8	20.0	10.0	3.3	9.1	3.4	5.9	5.9
Fissures	--	--	--	--	--	3.0	1.1	2.9	1.1
Serrations	--	--	--	--	--	--	1.1	--	0.4
Red tip and/or lateral margins	--	1.8	--	--	3.3	9.1	--	--	1.8

APPENDIX TABLE 23 (Continued) DETAILED CLINICAL FINDINGS BY TIME IN SERVICE, MILITARY, MALAYA

Time in Service	0-30 days	1-4 months	5-11 months	1-2 years	3-4 years	5-7 years	8-12 years	13-20 years	Total
Number examined	11	57	5	10	30	33	89	34	269
				Percent Prevalence					
Glands									
Thyroid enlarged	--	1.8	--	--	--	--	--	--	0.4
Skin, General									
Follicular hyperkeratosis									
Anywhere	18.2	3.5	--	10.0	6.7	3.0	7.9	2.9	5.9
Arms	--	--	--	--	--	3.0	--	--	0.4
Back - Slight	9.1	1.8	--	--	3.3	3.0	4.5	2.9	3.3
Moderate/Severe	--	1.8	--	10.0	--	--	1.1	--	1.1
Chest - Slight	9.1	1.8	--	--	6.7	--	4.5	--	3.0
Moderate/Severe	--	--	--	10.0	--	--	--	--	0.4
Perifolliculosis	--	3.5	--	--	--	--	--	--	0.7
Dry skin	--	24.6	--	--	--	--	--	--	5.2
Acneform eruption	--	5.3	--	--	3.3	--	--	2.9	1.8
Lower Extremities									
Loss of ankle jerk - Bilateral	9.1	--	--	--	6.7	3.0	1.1	2.9	2.2
Loss of knee jerk - Bilateral	--	--	--	--	3.3	--	2.2	--	1.1

APPENDIX TABLE 24. CLINICAL FINDINGS BY EXAMINER, DETAILED VS. ABBREVIATED EXAMINATIONS, MILITARY, MALAYA

Examination	Detailed				Abbreviated						
Examiner Number	3	6	7	Total	1	3	4	6	7	9	Total
Number Examined	35	102	132	269	127	178	282	238	270	173	1,268
	Percent Prevalence										
Eyes											
Thickened opaque bulbar conjunctivae	2.8		22.0	11.2							
Pingueculae	20.0	74.5	2.3	32.0							
Bitot's spots		1.0		0.4							
Conjunctival injection		2.9	3.8	3.0							
Skin, Face and Neck											
Nasolabial seborrhea	28.6	11.8	27.3	21.6	6.3	15.7	14.2	15.5	10.7	3.5	11.7
Other seborrhea			8.3	4.1							
Lips											
Angular lesions		2.0		0.7	0.8	1.7	0.7		0.7	0.6	0.7
Angular scars		18.6	0.8	7.4	6.3	1.7	1.1	0.4	4.1		2.0
Cheilosis						0.6					0.1
Gums											
Marginal redness			55.3	27.1							
Marginal swelling			60.6	29.7							
Atrophy of papillae	2.8	1.0	18.9	10.0							
Recession	17.1	5.9	32.6	20.4							
Swollen red papillae											
Localized		18.6	9.1	11.5	4.7	11.2	1.8	4.6	4.8	7.5	5.4
Diffuse	2.8	17.6	9.1	11.5	7.1	16.8	0.4	10.1	12.6	13.3	9.5
Tongue											
Filiform papillary atrophy											
Slight		1.0	1.5	1.1		1.1	2.1	0.8	1.5		1.1
Moderate									0.4		0.1
Fungiform papillary atrophy											
Slight	2.8			0.4							
Moderate			0.8	0.4							
Papillary hypertrophy											
Slight			0.8	0.4							

APPENDIX TABLE 24 (Continued) CLINICAL FINDINGS BY EXAMINER, DETAILED VS. ABBREVIATED EXAMINATIONS, MILITARY, MALAYA

Examination	Detailed				Abbreviated						
Examiner Number	3	6	7	Total	1	3	4	6	7	9	Total
Number Examined	35	102	132	269	127	178	282	238	270	173	1,268
	Percent Prevalence										
Tongue (continued)											
Geographic		2.0	3.0	2.2							
Furrows	5.7	2.9	8.3	5.9							
Fissures	5.7		0.8	1.1							
Serrations			0.8	0.4							
Red, tip and/or lateral margins		3.9	0.8	1.8							
Glossitis									0.7		0.2
Magenta colored									2.2		0.5
Glands											
Thyroid enlarged - Grade I			0.8	0.4	2.4	0.6	0.4		1.1		0.6
Skin, General											
Follicular hyperkeratosis 1/											
Anywhere		2.9	9.8	5.9	0.8	1.7	0.4	2.1	0.7		0.9
Arms - Slight			0.8	0.4		1.1	0.4				0.2
Back - Slight		2.0	5.3	3.3	0.8	0.6	0.4	2.1	0.7		0.8
Moderate/severe		1.0	1.5	1.1							
Chest - Slight			6.1	3.0							
Moderate/severe			0.8	0.4							
Thighs							0.4				0.1
Perifolliculosis			1.5	0.7							
Xerosis			10.6	5.2							
Acneform eruption		2.0	2.3	1.8							
Lower Extremities											
Loss of ankle jerk											
Unilateral						0.6	0.4	2.1	0.4		0.6
Bilateral	2.8	4.9		2.2	2.4	1.1	2.5	2.5	1.5	0.6	1.8
Calf tenderness									0.7		0.2
Loss of knee jerk											
Bilateral		2.0	0.8	1.1							

1/ Categorized as slight or moderate/severe on detailed examinations only.

APPENDIX TABLE 25. BIOCHEMICAL FINDINGS BY LOCATION, MILITARY, MALAYA

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
					BLOOD				
Total Plasma Protein gm/100 ml									
No.	13	10	25	5	6	19	25	20	123
Mean	7.4	7.2	7.3	7.6	7.3	7.2	6.8	7.7	7.3
S.E.1/	0.14	0.10	0.09	0.36	0.17	0.07	0.09	0.11	0.05
					Percent Distribution				
6.00-6.39 2/	--	--	--	--	--	--	16.0	--	3.2
6.40-6.99	15.4	10.0	36.0	20.0	16.7	31.6	56.0	10.0	29.3
≥7.00	84.6	90.0	64.0	80.0	83.3	68.4	28.0	90.0	67.5
Albumin/Globulin Ratio									
No.	13	10	25	5	6	19	25	20	123
Mean	1.22	1.41	1.53	1.42	1.23	1.37	1.26	0.80	1.27
S.E.	0.05	0.10	0.06	0.10	0.07	0.05	0.05	0.04	0.03
					Percent Distribution				
0.5-0.9	--	--	--	--	--	5.3	--	80.0	13.3
1.0-1.4	92.3	60.0	36.0	40.0	83.3	68.4	80.0	20.0	57.7
1.5-1.9	7.7	30.0	56.0	60.0	16.7	26.3	20.0	--	26.0
≥2.0	--	10.0	8.0	--	--	--	--	--	2.4
Plasma Albumin gm/100 ml									
No.	13	10	25	5	6	19	25	20	123
Mean	4.0	4.2	4.4	4.5	4.0	4.1	3.8	3.4	4.0
S.E.	0.07	0.08	0.05	0.15	0.08	0.07	0.04	0.11	0.04
					Percent Distribution				
<2.5	--	--	--	--	--	--	--	5.0	0.8
2.5-3.4	--	--	--	--	--	5.3	4.0	40.0	8.1
3.5-5.0	100.0	100.0	100.0	100.0	100.0	94.7	96.0	55.0	91.0
>5.0	--	--	--	--	--	--	--	--	--
Plasma Globulin gm/100 ml									
No.	13	10	25	5	6	19	25	20	123
Mean	3.4	3.0	3.0	3.2	3.3	3.1	3.1	4.2	3.3
S.E.	0.12	0.14	0.10	0.26	0.17	0.08	0.09	0.13	0.06
					Percent Distribution				
1.0-1.9	--	--	--	--	--	--	--	--	--
2.0-2.9	15.4	30.0	56.0	60.0	33.3	42.1	40.0	--	34.1
3.0-3.5	53.8	50.0	32.0	20.0	50.0	52.6	40.0	10.0	37.4
>3.5	30.8	20.0	12.0	20.0	16.7	5.3	20.0	90.0	28.4

1/ S.E. = standard error.

2/ See Appendix Table 49 for categorization of biochemical distributions.

APPENDIX TABLE 25 (Continued) BIOCHEMICAL FINDINGS BY LOCATION, MILITARY, MALAYA

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
Hemoglobin gm/100 ml									
No.	13	10	25	5	6	21	25	20	125
Mean	16.5	17.6	15.0	16.1	16.1	14.7	15.4	16.3	15.7
S.E.	0.37	0.58	0.37	0.49	0.56	0.32	0.21	0.22	0.14
				Percent Distribution					
<12.0	--	--	4.0	--	--	--	--	--	0.8
12.0-13.9	7.7	--	12.0	--	--	28.6	8.0	--	9.6
14.0-14.9	--	--	24.0	20.0	33.3	23.8	20.0	10.0	16.8
≥15.0	92.3	100.0	60.0	80.0	66.7	47.6	72.0	90.0	72.8
Hematocrit percent									
No.	13	10	23	4	6	21	25	20	122
Mean	45.8	48.7	43.5	45.8	44.7	43.1	44.5	46.2	44.9
S.E.	0.84	0.76	0.55	1.11	1.31	0.70	0.57	0.46	0.29
				Percent Distribution					
<36	--	--	--	--	--	--	--	--	--
36-41	7.7	--	26.1	--	16.7	33.3	20.0	--	16.4
42-44	23.1	--	39.1	25.0	50.0	28.6	24.0	15.0	25.4
≥45	69.2	100.0	34.8	75.0	33.3	38.1	56.0	85.0	58.2
Mean Corpuscular Hemoglobin Concentration percent									
No.	13	10	23	4	6	21	25	20	122
Mean	36.0	36.4	34.4	35.2	36.1	34.2	34.7	35.2	35.0
S.E.	0.59	1.16	0.88	0.48	1.33	0.46	0.45	0.38	0.25
				Percent Distribution					
<28.0	--	--	4.3	--	--	--	4.0	--	1.6
28.0-29.9	--	--	--	--	--	--	--	--	--
30.0-31.9	--	--	8.7	--	--	14.3	--	5.0	4.9
≥32.0	100.0	100.0	87.0	100.0	100.0	85.7	96.0	95.0	93.4
Plasma Vitamin C mg/100 ml									
No.	13	10	24	--	6	19	25	20	117
Mean	0.51	0.36	0.73	--	0.36	0.44	0.23	0.28	0.42
S.E.	0.07	0.05	0.05	--	0.06	0.04	0.01	0.02	0.02
				Percent Distribution					
<0.10	--	--	--	--	--	--	--	--	--
0.10-0.19	15.4	10.0	--	--	16.7	--	32.0	15.0	12.8
0.20-0.39	23.1	70.0	4.2	--	33.3	47.4	68.0	80.0	47.0
≥0.40	61.5	20.0	95.8	--	50.0	52.6	--	5.0	40.2

APPENDIX TABLE 25 (Continued) BIOCHEMICAL FINDINGS BY LOCATION, MILITARY, MALAYA

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
Plasma Vitamin A µg/100 ml									
No.	13	10	24	4	6	18	25	20	120
Mean	48.2	50.5	37.4	59.0	47.7	42.2	49.4	44.8	45.3
S.E.	3.8	3.7	3.0	6.4	4.3	2.1	1.9	3.1	1.2
				Percent Distribution					
<10	--	--	4.2	--	--	--	--	--	0.8
10-19	--	--	12.5	--	--	--	--	--	2.5
20-49	53.8	50.0	66.7	25.0	50.0	83.3	35.0	70.0	58.3
≥50	46.2	50.0	16.7	75.0	50.0	16.7	64.0	30.0	38.3
Plasma Carotene µg/100 ml									
No.	13	10	24	5	6	18	25	20	121
Mean	102	95	106	95	118	89	88	95	97
S.E.	8	10	10	15	12	4	3	5	3
				Percent Distribution					
<20	--	--	--	--	--	--	--	--	--
20-39	--	--	--	--	--	--	--	--	--
40-99	46.2	60.0	58.3	40.0	33.3	72.2	76.0	65.0	62.0
≥100	53.8	40.0	41.7	60.0	66.7	27.8	24.0	35.0	38.0
Plasma Cholesterol mg/100 ml									
No.	13	10	25	5	6	19	25	18	121
Mean	230	207	179	139	178	148	159	207	180
S.E.	8.8	12.4	6.8	7.5	17.6	6.6	5.3	12.6	4.0
				Percent Distribution					
70-99	--	--	--	--	--	5.3	--	--	0.8
100-149	--	--	20.0	80.0	33.3	42.1	32.0	11.1	24.0
150-199	15.4	50.0	44.0	20.0	33.3	47.4	64.0	27.8	42.1
≥200	84.6	50.0	36.0	--	33.3	5.3	4.0	61.1	33.0
Plasma β-Lipoprotein 1/ mm									
No.	13	--	25	5	6	19	25	20	113
Mean	3.5	--	3.2	3.3	2.5	3.0	2.5	3.0	3.0
S.E.	0.12	--	0.13	0.16	0.30	0.14	0.08	0.14	0.06
Plasma Lipid Phosphorus mg/100 ml									
No.	13	10	25	5	6	19	25	18	121
Mean	11.1	11.4	10.6	10.7	10.6	10.1	9.4	9.5	10.2
S.E.	0.54	0.64	0.30	0.20	0.84	0.42	0.27	0.75	0.19

1/ By precipitin technic.

APPENDIX TABLE 25 (Continued) BIOCHEMICAL FINDINGS BY LOCATION, MILITARY, MALAYA

Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
					URINE				
Thiamine µg/gm creatinine									
No.	12	10	20	3	5	19	22	15	106
Median	34	27	42	147	41	48	110	44	52
				Percent Distribution					
<27	41.7	50.0	25.0	--	20.0	21.0	--	26.7	22.6
27-65	41.7	30.0	65.0	33.3	80.0	52.6	--	53.3	41.5
66-129	8.3	10.0	--	--	--	15.8	72.7	13.3	21.7
≥130	8.3	10.0	10.0	66.7	--	10.5	27.3	6.7	14.2
Riboflavin µg/gm creatinine									
No.	12	10	23	4	5	19	25	20	118
Median	26	20	23	12	38	21	94	36	32
				Percent Distribution					
<27	58.3	70.0	56.5	75.0	40.0	57.9	4.0	30.0	42.4
27-79	33.3	30.0	34.8	--	40.0	42.1	40.0	65.0	40.7
80-269	--	--	4.3	--	20.0	--	56.0	--	13.6
≥270	8.3	--	4.3	25.0	--	--	--	5.0	3.4
N'-Methylnicotinamide mg/gm creatinine									
No.	11	10	6	4	5	19	25	15	95
Median	5.6	4.9	3.0	1.7	4.7	4.0	4.4	4.4	4.2
				Percent Distribution					
<0.5	--	--	16.7	--	--	--	--	--	1.0
0.5-1.59	--	--	--	50.0	--	--	4.0	--	3.2
1.6-4.29	36.4	40.0	66.7	50.0	40.0	57.9	44.0	46.7	47.4
≥4.30	63.6	60.0	16.7	--	60.0	42.1	52.0	53.3	48.4

APPENDIX TABLE 26. BIOCHEMICAL FINDINGS BY AGE, MILITARY, MALAYA

Age (years)	18-19	20-24	25-29	30-34	35-39	Total
	BLOOD					
Total Plasma Protein gm/100 ml						
No.	12	49	36	20	6	123
Mean	6.8	7.2	7.4	7.4	7.5	7.3
S.E.1/	0.13	0.08	0.08	0.11	0.23	0.05
		Percent Distribution				
6.00-6.39 2/	16.7	4.1	--	--	--	3.2
6.40-6.99	41.7	40.8	16.7	20.0	16.7	29.3
≥7.00	41.7	55.1	83.3	80.0	83.3	67.5
Albumin/Globulin Ratio						
No.	12	49	36	20	6	123
Mean	1.22	1.28	1.22	1.37	1.28	1.27
S.E.	0.08	0.04	0.07	0.06	0.07	0.03
		Percent Distribution				
0.5-0.9	8.3	10.2	25.0	10.0	--	13.8
1.0-1.4	75.0	63.3	50.0	45.0	66.7	57.7
1.5-1.9	16.7	24.5	19.4	45.0	33.3	26.0
≥2.0	--	2.0	5.6	--	--	2.4
Plasma Albumin gm/100 ml						
No.	12	49	36	20	6	123
Mean	3.7	4.0	3.9	4.2	4.2	4.0
S.E.	0.05	0.06	0.08	0.08	0.13	0.04
		Percent Distribution				
<2.5	--	2.0	--	--	--	0.8
2.5-3.4	8.3	4.1	16.7	5.0	--	8.1
3.5-5.0	91.7	93.9	83.3	95.0	100.0	91.0
>5.0	--	--	--	--	--	--
Plasma Globulin gm/100 ml						
No.	12	49	36	20	6	123
Mean	3.1	3.2	3.4	3.2	3.3	3.3
S.E.	0.14	0.08	0.13	0.12	0.18	0.06
		Percent Distribution				
1.0-1.9	--	--	--	--	--	--
2.0-2.9	41.7	32.6	33.3	40.0	16.7	34.1
3.0-3.5	33.3	40.8	33.3	35.0	50.0	37.4
>3.5	25.0	26.5	33.3	25.0	33.3	28.4

1/ S.E. = standard error.
2/ See Appendix Table 49 for categorization of biochemical distributions.

APPENDIX TABLE 26 (Continued) BIOCHEMICAL FINDINGS BY AGE, MILITARY, MALAYA

Age (years)	18-19	20-24	25-29	30-34	35-39	Total
Hemoglobin gm/100 ml						
No.	12	50	36	21	6	125
Mean	15.3	15.4	16.2	15.8	15.9	15.7
S.E.	0.30	0.22	0.24	0.48	0.76	0.14
		Percent Distribution				
<12.0	--	2.0	--	--	--	0.8
12.0-13.9	8.3	8.0	5.6	19.0	16.7	9.6
14.0-14.9	16.7	20.0	11.1	19.0	16.7	16.8
≥15.0	75.0	70.0	83.3	61.9	66.7	72.8
Hematocrit percent						
No.	12	48	36	21	5	122
Mean	44.5	45.0	45.7	43.7	43.6	44.9
S.E.	0.83	0.44	0.50	0.80	1.50	0.29
		Percent Distribution				
<36	--	--	--	--	--	--
36-41	16.7	16.7	11.1	23.8	20.0	16.4
42-44	33.3	20.8	19.4	38.1	40.0	25.4
≥45	50.0	62.5	69.4	38.1	40.0	58.2
Mean Corpuscular Hemoglobin Concentration percent						
No.	12	48	36	21	5	122
Mean	34.4	34.2	35.5	36.1	35.6	35.0
S.E.	0.59	0.44	0.34	0.77	0.58	0.25
		Percent Distribution				
<28.0	--	4.2	--	--	--	1.6
28.0-29.9	--	--	--	--	--	--
30.0-31.9	--	8.3	2.8	4.8	--	4.9
≥32.0	100.0	87.5	97.2	95.2	100.0	93.4
Plasma Vitamin C mg/100 ml						
No.	12	47	34	19	5	117
Mean	0.22	0.44	0.41	0.48	0.62	0.42
S.E.	0.02	0.04	0.04	0.07	0.15	0.02
		Percent Distribution				
<0.10	--	--	--	--	--	--
0.10-0.19	41.7	6.4	14.7	10.5	--	12.8
0.20-0.39	58.3	46.8	44.1	47.4	40.0	47.0
≥0.40	--	46.8	41.2	42.1	60.0	40.2

APPENDIX TABLE 26 (Continued) BIOCHEMICAL FINDINGS BY AGE, MILITARY, MALAYA

Age (years)	18-19	20-24	25-29	30-34	35-39	Total
Plasma Vitamin A µg/100 ml						
No.	12	47	35	20	6	120
Mean	49.8	66.6	45.2	42.7	45.5	45.3
S.E.	2.5	1.8	1.9	3.7	9.5	1.2
			Percent Distribution			
<10	--	--	--	--	16.7	0.8
10-19	--	2.1	--	10.0	--	2.5
20-49	33.3	59.6	71.4	60.0	16.7	58.3
≥50	66.7	38.3	29.6	30.0	66.7	38.3
Plasma Carotene µg/100 ml						
No.	12	48	35	20	6	121
Mean	87	98	96	94	127	97
S.E.	4	4	4	6	36	3
			Percent Distribution			
<20	--	--	--	--	--	--
20-39	--	--	--	--	--	--
40-99	75.0	62.5	57.1	70.0	33.3	62.0
≥100	25.0	37.5	42.8	30.0	66.7	38.0
Plasma Cholesterol mg/100 ml						
No.	11	49	35	20	6	121
Mean	156	176	196	175	190	180
S.E.	5.8	5.8	9.1	8.9	15.4	4.0
			Percent Distribution			
70-99	--	2.0	--	--	--	0.8
100-149	36.4	20.4	25.7	25.0	16.7	24.0
150-199	63.6	51.0	20.0	55.0	16.7	42.1
≥200	--	26.5	54.3	20.0	66.7	33.0
Plasma β-Lipoprotein 1/ mm						
No.	12	48	32	16	5	113
Mean	2.6	2.8	3.2	3.2	3.5	3.0
S.E.	0.10	0.08	0.11	0.19	0.22	0.06
Plasma Lipid Phosphorus mg/100 ml						
No.	11	49	35	20	6	121
Mean	10.1	10.1	10.2	10.4	10.9	10.2
S.E.	0.47	0.29	0.41	0.36	0.62	0.19

1/ By precipitin technic.

APPENDIX TABLE 26 (Continued) BIOCHEMICAL FINDINGS BY AGE, MILITARY, MALAYA

Age (years)	18-19	20-24	25-29	30-34	35-39	Total
	URINE					
Thiamine						
μg/gm creatinine						
No.	12	40	30	19	5	106
Median	111	63	32	46	46	52
		Percent Distribution				
<27	--	15.0	43.3	26.3	--	22.6
27-65	8.3	37.5	46.7	47.4	100.0	41.5
66-129	58.3	35.0	3.3	5.3	--	41.5
≥130	33.3	12.5	6.7	21.0	--	14.2
Riboflavin						
μg/gm creatinine						
No.	12	46	35	20	5	118
Median	77	38	27	34	15	32
		Percent Distribution				
<27	8.3	39.1	48.6	50.0	80.0	42.4
27-79	41.7	37.0	48.6	45.0	--	40.7
80-269	50.0	19.6	--	5.0	--	13.6
≥270	--	4.3	2.8	--	20.0	3.4
N'-Methylnicotinamide						
mg/gm creatinine						
No.	11	37	26	17	4	95
Median	4.8	3.8	4.5	4.9	3.9	4.2
		Percent Distribution				
<0.50	--	--	--	5.9	--	1.0
0.50-1.59	--	5.4	--	5.9	--	3.2
1.60-4.29	36.4	56.8	46.2	29.4	75.0	47.4
≥4.30	63.6	37.8	53.8	58.8	25.0	48.4

APPENDIX TABLE 27. BIOCHEMICAL FINDINGS BY PERCENT OF "STANDARD WEIGHT," MILITARY, MALAYA

Percent "Standard Weight"	75-89	90-99	100-109	110+	Total
		BLOOD			
Total Plasma Protein gm/100 ml					
No.	45	44	19	15	123
Mean	7.2	7.1	7.5	7.5	7.3
		Percent Distribution			
6.00-6.39[1/]	4.4	4.5	--	--	3.2
6.40-6.99	35.6	38.6	15.8	--	29.3
≥7.00	60.0	56.8	84.2	100.0	67.5
Albumin/Globulin Ratio					
No.	45	44	19	15	123
Mean	1.32	1.33	1.16	1.10	1.27
		Percent Distribution			
0.5-0.9	6.7	4.5	31.6	40.0	13.8
1.0-1.4	64.4	59.1	52.6	40.0	57.7
1.5-1.9	28.9	31.8	10.5	20.0	26.0
≥2.0	--	4.5	5.3	--	2.4
Plasma Albumin gm/100 ml					
No.	45	44	19	15	123
Mean	4.0	4.0	3.9	3.9	4.0
		Percent Distribution			
<2.5	--	2.3	--	--	0.8
2.5-3.4	4.4	4.5	15.8	20.0	8.1
3.5-5.0	95.6	93.2	84.2	80.0	91.0
>5.0	--	--	--	--	--
Plasma Globulin gm/100 ml					
No.	45	44	19	15	123
Mean	3.2	3.1	3.5	3.6	3.3
		Percent Distribution			
1.0-1.9	--	--	--	--	--
2.0-2.9	37.8	43.2	26.3	6.7	34.1
3.0-3.5	40.0	34.1	36.8	40.0	37.4
>3.5	22.2	22.7	36.8	53.3	28.4
Hemoglobin gm/100 ml					
No.	47	44	19	15	125
Mean	15.2	15.7	16.0	16.6	15.7
		Percent Distribution			
<12.0	--	2.3	--	--	0.8
12.0-13.9	17.0	2.3	10.5	6.7	9.6
14.0-14.9	25.5	13.6	10.5	6.7	16.8
≥15.0	57.4	81.8	78.9	86.7	72.8

1/ See Appendix Table 49 for categorization of biochemical distributions.

APPENDIX TABLE 27 (Continued) BIOCHEMICAL FINDINGS BY PERCENT OF "STANDARD WEIGHT," MILITARY, MALAYA

Percent "Standard Weight"	75-89	90-99	100-109	110+	Total
Hematocrit percent					
No.	46	42	19	15	122
Mean	43.9	45.2	45.5	45.9	44.9
		Percent Distribution			
<36	--	--	--	--	--
36-41	28.3	9.5	10.5	6.7	16.4
42-44	28.3	23.8	31.6	13.3	25.4
≥45	43.5	66.7	57.9	80.0	58.2
Mean Corpuscular Hemoglobin Concentration, percent					
No.	46	42	19	15	122
Mean	34.8	34.7	35.2	36.1	35.0
		Percent Distribution			
<28.0	--	2.4	5.3	--	1.6
28.0-29.9	--	--	--	--	--
30.0-31.9	10.9	2.4	--	--	4.9
≥32.0	89.1	95.2	94.7	100.0	93.4
Plasma Vitamin C mg/100 ml					
No.	41	42	19	15	117
Mean	0.44	0.40	0.47	0.36	0.42
		Percent Distribution			
<0.10	--	--	--	--	--
0.10-0.19	4.9	16.7	10.5	26.7	12.8
0.20-0.39	48.8	42.8	47.4	53.3	47.0
≥0.40	46.3	40.5	42.1	20.0	40.2
Plasma Vitamin A μg/100 ml					
No.	45	41	19	15	120
Mean	44.8	45.5	43.0	49.4	45.3
		Percent Distribution			
<10	--	2.4	--	--	0.8
10-19	6.7	--	--	--	2.5
20-49	57.8	53.6	73.7	53.3	58.3
≥50	35.6	43.9	26.3	46.7	38.3
Plasma Carotene μg/100 ml					
No.	45	42	19	15	121
Mean	95	98	102	94	97
		Percent Distribution			
<20	--	--	--	--	--
20-39	--	--	--	--	--
40-99	62.2	69.0	47.4	60.0	62.0
≥100	37.8	31.0	52.6	40.0	38.0

APPENDIX TABLE 27 (Continued) BIOCHEMICAL FINDINGS BY PERCENT OF "STANDARD WEIGHT," MILITARY, MALAYA

Percent "Standard Weight"	75-89	90-99	100-109	110+	Total
Plasma Cholesterol mg/100 ml					
No.	45	44	19	13	121
Mean	163	171	203	240	180
		Percent Distribution			
70-99	2.2	--	--	--	0.8
100-149	33.3	25.0	15.8	--	24.0
150-199	46.7	52.3	26.3	15.4	42.1
≥200	17.8	22.7	57.9	84.6	33.0
Plasma β-Lipoprotein[1/] mm					
No.	43	42	18	10	113
Mean	2.9	2.8	3.2	3.5	3.0
Plasma Lipid Phosphorus mg/100 ml					
No.	45	44	19	13	121
Mean	10.0	9.9	10.6	11.3	10.2
		URINE			
Thiamine µg/gm creatinine					
No.	38	39	16	13	106
Median	70	54	38	39	52
		Percent Distribution			
<27	18.4	17.9	37.5	30.8	22.6
27-65	28.9	46.2	43.8	61.5	41.5
66-129	36.8	15.4	12.5	7.7	21.7
≥130	15.8	20.5	6.2	--	14.2
Riboflavin µg/gm creatinine					
No.	44	40	19	15	118
Median	37	37	20	25	32
		Percent Distribution			
<27	40.9	30.0	57.9	60.0	42.4
27-79	36.4	47.5	36.8	33.3	40.7
80-269	18.2	20.0	--	6.7	13.6
≥270	4.5	2.5	5.3	--	3.4
N'-Methylnicotinamide mg/gm creatinine					
No.	35	33	16	11	95
Median	4.1	4.7	4.0	3.9	4.2
		Percent Distribution			
<0.50	--	--	--	9.1	1.0
0.50-1.59	5.7	3.0	--	--	3.2
1.60-4.29	48.6	39.4	56.2	54.5	47.4
≥4.30	45.7	57.6	43.8	36.4	48.4

1/ By precipitin technic.

APPENDIX TABLE 28. NUTRIENT INTAKE BY RECIPE METHOD, MILITARY, MALAYA, 1962

Military Unit	Calories	Protein gm	Carbo-hydrate gm	Fat gm	Cal-cium mg	Iron mg	Vitamin A IU	Thia-mine mg	Ribo-flavin mg	Niacin mg	Vitamin C mg
Bn A, RMR	2,970	84	480	79	422	17	2,840	1.21	1.04	18.2	90
Bn B, RMR	3,070	70	473	97	391	19	13,770	0.55	1.52	10.6	65
Bn C, RMR	2,702	70	445	73	404	17	3,926	0.55	0.90	8.6	48
Bn D, RMR	3,510	90	487	130	748	21	12,840	0.76	1.17	12.4	123
Bn E, RMR	2,896	83	424	95	442	19	4,295	0.75	0.95	10.7	78
RECCE	3,100	76	431	121	450	21	2,995	0.87	0.88	8.7	51
Average	3,041	79	456	99	476	19	6,777	0.78	1.08	11.5	76

APPENDIX TABLE 29. NUTRIENT INTAKE BY CHEMICAL ANALYSIS, MILITARY, MALAYA, 1962

Military Unit	Calories	Protein gm	Carbo-hydrate gm	Fat gm	Cal-cium mg	Iron mg	Vitamin A IU	Thia-mine mg	Ribo-flavin mg	Niacin mg	Vitamin C mg	Salt (NaCl) gm
Bn A, RMR	2,800	79	490	58	550	26	<1,000	<0.60	0.98	13.6	29	11.5
Bn B, RMR	2,784	112	469	50	350	26	<1,000	<0.60	1.83	13.9	22	10.9
Bn C, RMR	2,600	97	460	43	410	22	<1,000	<0.60	0.82	12.5	19	11.7
Bn D, RMR	3,015	97	520	61	580	17	2,150	0.60	1.06	14.8	24	12.2
Bn E, RMR	2,926	94	492	66	570	40	4,000	0.60	0.98	10.1	17	14.6
RECCE	2,838	108	425	78	320	25	2,000	<0.60	0.99	34.0	33	9.1
Average	2,827	98	477	59	463	26	1,850	<0.60	1.11	16.5	24	

APPENDIX TABLE 30. SUGGESTED GUIDE TO INTERPRETATION OF NUTRIENT INTAKE DATA[1/]

	"Deficient"	"Low"	"Acceptable"	"High"
Protein (gm/person/kg)	<0.50	0.50-0.99	1.00-1.49	1.50+
Calcium (mg/person/day)	<300	300-399	400-799	800+
Iron (mg/person/day)	<6.0	6.0-8.9	9.0-11.9	12.0+
Vitamin A (IU/person/day)	<2,000	2,000-3,499	3,500-4,999	5,000+
Vitamin C (mg/person/day)	<10.0	10.0-29.9	30.0-49.9	50.0+
Thiamine (mg/1,000 Calories)	<0.20	0.20-0.29	0.30-0.49	0.50+
Riboflavin (mg/person/day)	<0.70	0.70-1.19	1.20-1.59	1.60+
Niacin (mg/person/day)	<5.0	5.0-9.9	10.0-14.9	15.0+

1/ Based primarily on standards for the young adult male; see Manual for Nutrition Surveys, 1st ed., 1957.

APPENDIX TABLE 31. ARMED FORCES INTERIM OPERATION PACK RATION SCALE[1/]
(Charwick 2 in 1)

Serial No.	Commodity	Scale per ration oz	Scale per ration gm
1.	Biscuits, service	3	85
2.	Curried beef Halal	4	113
3.	Curried mutton Halal	4	113
4.	Vegetables, tinned (peas)	5	142
5.	Fruit, tinned (pineapple)	4	113
6.	Rice	14	397
7.	Tea	1/2	14
8.	Lemonade/orangeade powder	1/2	14
	Sugar	1/4	7
9.	Sugar	1 1/2	43
10.	Milk, tinned	2 3/4	78
11.	Salt	1	28
12.	Jam	1 1/2	43
13.	Vitamin tablets	1 tablet	-
14.	Matches	1 packet	-
15.	Toilet paper	4 sheets	-

1/ As authorized by Hq. Federation Supplies and Transport Services (AFMC), August 1962

APPENDIX TABLE 32. AVERAGE GRAMS OF MAJOR FOOD ITEMS CONSUMED PER MAN PER DAY BY RECIPE CALCULATION METHOD, MILITARY, MALAYA[1/]

Food Item	gm/man/day	Food Item	gm/man/day
Cereals		Fruits	
Bread	65	Banana	44
Flour, white	14	Papaya	19
Rice, fried	370	Pineapple	52
Rice, glutinous	10	Rambutan	13
Starches		Meat	
Potato, fresh	29	Beef, boneless	87
Potato, tinned	15	Beef stew, tinned	1
Sugars		Liver, beef	5
Sugar	73	Mutton	4
Sugar, brown	1	Eggs	57
Jam, fruit	4	Fish	
Jam, egg	1	Fish, fresh	70
Pulses		Fish, dried	5
Coconut	90	Prawns, dried	3
Dhall	4	Milk	
Green gram	4	Milk, evaporated	75
Vegetables		Oils	
Cabbage	54	Coconut oil	32
Cucumbers	25	Ghi	2
French beans	2	Margarine	9
Garlic	3	Miscellaneous	
Green peppers	4	Salt	11
Ladies' fingers (okra)	10	Ginger, fresh	4
Long beans	22	Chillies, dried	2
Mustard greens	29	Soya sauce	2
Onions	31	Soybean curd	1
Red peppers	2	Chilli, curd	2
String beans, tinned	7	Spices, other	2
Tomatoes	13	Lemonade, powdered (ascorbic acid)	

1/ As determined by Total Food/Total Men Fed (1,680) for a 12-day period.

APPENDIX TABLE 33. PROTEIN CONTENT OF RICE SAMPLES COLLECTED AT SURVEY SITES, MILITARY, MALAYA, 1962

Military Unit	Protein gm
Bn A, RMR	6.43
Bn B, RMR	6.43
Bn C, RMR	6.69
Bn D, RMR	6.37
Bn E, RMR	6.37
RECCE	7.00
Charwick, Mk II ration	7.00

APPENDIX TABLE 34. COMPARISON OF MEAN INDIVIDUAL NUTRIENT INTAKES PER MAN PER DAY, MILITARY, MALAYA, WITH THOSE OF OTHER FAR EASTERN COUNTRIES[1/]

Nutrients	Republic of China (Taiwan) 1954	Republic of China (Taiwan) 1960	Republic of Korea 1957	Republic of Vietnam 1959	Republic of Philippines 1958	Kingdom of Thailand 1960	Union of Burma 1961	Federation of Malaya 1962
Total Calories	3,610	2,857	3,814	3,123	2,638	2,947	3,028	2,827
Protein, gm	95	93	127	100	105	84	83.4	99
Protein, percent of Calories	10.5	13.7	13.3	12.8	15.9	11.4	11.0	14.1
Fat, gm	77	38	43	45	30	35	51.5	59
Fat, percent of Calories	19.2	11.8	10.2	12.9	10.2	11.1	15.3	19.0
Carbohydrate, gm	630	539	730	580	488	570	573	477
Carbohydrate, percent of Calories	70.3	75.2	76.5	74.3	73.9	77.7	75.7	66.9
Calcium, mg	697	957	780	850	1,054	675	470	463
Iron, mg	23.9	50.6	34.0	32.0	26.0	63.0	34.0	26.0
Iodine, mg	--	--	--	1.25	--	0.11	--	--
Salt, gm	15.6	12.9	20.1	13.7	--	18.1	--	--
Vitamin A, IU	6,155	2,835	1,218	3,101	2,496	<1,795	2,610	1,850
Thiamine, mg	1.43	--	--	0.75	1.01	1.78	0.55	<0.60
Thiamine, mg/1,000 Calories	0.40	0.38	0.55	0.24	0.39	0.64	0.18	<0.20
Riboflavin, mg	0.86	--	--	1.13	0.75	0.90	1.10	1.11
Riboflavin, mg/1,000 Calories	0.24	0.80	0.26	0.38	0.28	0.31	0.36	0.40
Niacin, mg	18.0	25.5	21.1	17.8	19.0	33.5	9.8	16.5
Vitamin C, mg	68	17	55	47	43	30	73	24
Rice intake, gm	620	--	--	525	129	775	737	370

1/ As determined by chemical analyses of food composites.

APPENDIX TABLE 35. AVERAGE GRAMS CONSUMED PER MAN PER DAY FROM SIX TWO-DAY SURVEYS BY RECIPE METHOD INVOLVING 1,680 TROOPS OF ROYAL MALAYAN ARMY

Food	Grams per man per day	Calories	Protein gm	Carbo-hydrate gm	Fat gm
Cereals					
Bread, white, fortified	65	179	5.3	33.9	2.1
Rice, dry	370	1,332	24.8	292.3	2.6
Flour, white	14	49	1.6	10.5	0.2
Rice, glutinous	10	36	0.7	7.9	0.1
Protein					
Beef, boneless	87	239	14.8	--	18.8
Beef, stew, tinned	1	3	0.2	--	0.2
Mutton	4	13	0.6	--	1.1
Liver, beef	5	7	1.0	0.3	0.1
Fresh fish	70	43	6.2	--	1.9
Dry fish	5	7	1.2	--	0.1
Dry prawns	3	9	1.9	--	0.1
Egg, hen	57	82	6.3	0.4	5.9
Soy curd	1	1	--	--	--
Green gram	4	14	1.0	2.3	--
Dhall	4	14	0.8	2.4	--
Vegetables					
Onion and garlic	34	13	0.4	2.2	--
Potato, fresh	29	20	0.5	4.9	--
Lady fingers	10	3	0.2	0.8	--
Chillies, dry	2	5	0.2	0.7	0.1
Green peppers	4	1	0.3	--	--
Long beans	23	10	0.7	2.9	0.1
Tomatoes	13	3	0.1	0.5	--
Cucumbers	25	3	0.2	0.8	--
Mustard greens	29	5	0.4	1.5	--
Cabbage	54	9	0.6	2.9	--
Potatoes, tinned	15	9	0.3	1.9	--
String beans, tinned	7	1	0.1	0.3	--
Red peppers	2	1	--	0.1	--
Fruits					
Rambutan	13	8	0.1	1.9	--
Banana	44	31	0.4	10.1	0.1
Papaya	19	7	0.1	1.9	--
Pineapple	52	16	0.2	7.1	0.1
Fats					
Coconut oil	32	283	--	--	32.0
Margarine	9	65	0.1	--	7.3
Ghi	2	16	--	--	1.8

APPENDIX TABLE 35 (Continued) AVERAGE GRAMS CONSUMED PER MAN PER DAY FROM SIX TWO-DAY SURVEYS BY RECIPE METHOD INVOLVING 1,680 TROOPS OF ROYAL MALAYAN ARMY

Calcium mg	Iron gm	Vitamin A IU	Thiamine mg	Riboflavin mg	Niacin mg	Vitamin C mg	Reference
42.2	1.2	--	0.16	0.10	1.4	--	U.S.D.A. No. 8, #138
37.0	3.3	--	0.30	0.11	5.9	--	
3.3	0.3	--	0.04	0.01	0.2	--	
1.2	0.1	--	0.02	--	--	--	
8.7	2.3	38	0.06	0.13	3.6	--	
0.1	--	--	--	--	--	--	
0.3	0.1	--	0.01	0.01	0.2	--	
0.3	0.3	2,195	0.01	0.17	0.7	1.5	
10.5	0.3	14	0.02	0.05	0.8	--	
1.9	--	--	--	--	0.1	--	
7.4	0.2	6	--	0.01	0.2	--	
25.1	1.2	507	0.05	0.15	0.1	--	
1.0	--	--	--	--	--	--	
5.8	0.3	12	0.02	0.01	0.1	0.2	
1.1	0.2	5	0.02	0.01	0.1	0.1	
10.2	0.2	17	0.01	0.01	0.1	2.7	
2.0	0.2	--	0.02	0.01	0.3	2.3	
6.6	0.1	32	0.01	0.01	0.1	1.8	
3.2	--	11	--	--	--	0.8	
0.2	--	10	--	--	--	3.3	
16.6	0.2	118	0.02	0.03	0.2	4.8	
1.4	0.1	143	0.01	0.01	0.1	3.0	
1.7	--	--	--	0.01	--	1.5	
11.8	0.2	194	0.01	0.02	0.1	9.0	
18.9	0.2	38	0.02	0.02	0.1	18.9	
1.0	0.1	--	0.01	--	0.1	1.3	
1.8	--	29	--	--	--	0.2	U.S.D.A.(No.8,#51)
0.1	--	15	--	--	--	1.8	
3.2	0.4	--	--	--	--	6.2	
2.6	0.2	79	0.01	0.01	0.2	3.9	
3.8	0.1	332	0.01	0.01	0.1	10.6	
6.2	0.2	31	0.03	0.01	0.1	13.5	
--	--	--	--	--	--	--	
1.8	--	180	--	--	--	--	
--	--	38	--	--	--	--	

APPENDIX TABLE 35 (Continued) AVERAGE GRAMS CONSUMED PER MAN PER DAY FROM SIX TWO-DAY SURVEYS BY RECIPE METHOD INVOLVING 1,680 TROOPS OF ROYAL MALAYAN ARMY

Food	Grams per man per day	Calories	Protein gm	Carbo-hydrate gm	Fat gm
Sugar and Sweets					
Sugar, granulated	73	281	--	72.6	--
Sugar, brown	1	4	--	1.0	--
Egg jam	1	4	--	0.8	--
Jam, miscellaneous	4	11	--	2.8	--
Miscellaneous					
Milk, evaporated	75	103	5.2	7.4	5.9
Coconut	89	143	1.7	4.0	13.9
Soya sauce	2	1	0.1	0.2	--
Ginger root	4	2	0.1	0.4	--
Curry powder	2	4	0.2	0.5	--
Coconut, shredded	2	7	--	0.3	0.6
Salt (NaCl)	11				
Other1/					
Total		3,097	78.6	480.5	95.1

1/ Spice, other, 2
Lemonade powder, trace
Custard powder, trace.

APPENDIX TABLE 35 (Continued) AVERAGE GRAMS CONSUMED PER MAN PER DAY FROM SIX TWO-DAY SURVEYS BY RECIPE METHOD INVOLVING 1,680 TROOPS OF ROYAL MALAYAN ARMY

Calcium mg	Iron gm	Vitamin A IU	Thiamine mg	Riboflavin mg	Niacin mg	Vitamin C mg	Reference
--	--	--	--	--	--	--	
0.7	--	--	--	--	--	--	
0.4	--	--	--	--	--	--	
--	--	--	--	--	--	0.2	
182.2	0.2	300	0.04	0.27	0.2	0.7	
3.6	0.7	--	0.03	0.01	0.3	0.9	FAO #64
2.4	0.2	--	--	--	--	--	
0.8	0.1	--	--	--	--	--	
12.7	1.5	180	--	--	0.1	2.6	
0.4	--	--	--	--	--	--	
442.2	14.7	4,524	0.94	1.19	15.5	91.8	

APPENDIX 36. GLOSSARY OF COMMONLY SERVED MALAY DISHES

Sambal belachan	Aged fish paste mixed with chillies, onions, etc.
Sambal telor	A fried dish of egg, belachan and sambal.
Ikan goreng	Fried fresh or salt fish.
Tumis tangeh	A common Malay dish made from bean sprouts, to which are added fried condiments and water.
Kueh kodok	A breakfast food made from water, wheat flour and salt. The batter is dropped into coconut oil and deep-fried.
Apam balek	A common Malay breakfast food similar to a pancake. The batter is made of wheat flour, water and sliced bananas. The kuali is lightly oiled and then rubbed with a piece of fresh coconut. Enough batter for one apam balek is spread thinly over the surface. When cooked, a spoonful of shredded fresh coconut and brown sugar is placed in the center and the cake is rolled up.
Tumis	Vegetables fried in coconut oil to which condiments and spices have been added.
Pisang goreng	Special varieties of bananas (green) sliced in half lengthwise and dipped in a batter of wheat flour and water, and deep-fried in coconut oil.
Roti chenai	A favorite breakfast item resembling a pancake, made from a soft dough of wheat flour, water and coconut oil. The oil is added by kneading and working the dough. The dough is kneaded in individual amounts, pulled and stretched over a flat surface until paper thin and then rolled in a long thin strip and wound in a spiral to give a circular flat cake about six inches in diameter which is fried in the kuali. They are usually sprinkled with sugar before eating.
Adar-adar	A pancake batter of wheat flour and water. After frying, the pancake is spread with a previously fried mixture of shredded fresh coconut and brown and white sugar.
Goreng keledek	Keledek is similar to sweet potato. In Malaya it is often sliced raw, dipped in rice flour and water and deep-fried in coconut oil for breakfast.
Achar timun	Raw cucumber mixed with raw onion and fresh chilli, resembling a pickle.
Gulai ikan (fish curry)	Fish cooked in water or santan to which condiments and spices are added.
Goreng kachang	Long green beans fried in coconut oil with ikan bilis.
Sayor lemak paku	Young fern shoots boiled in santan to which condiments are added.

APPENDIX TABLE 37. RECOMMENDED DAILY DIETARY ALLOWANCES[1/], MALAYA[2/]

	Age (years)	Body Weight kg	Calories	Protein gm	Calcium gm	Iron mg	Vita-min A IU	Thia-mine mg	Ribo-flavin mg	Niacin[3/] mg equiv-alent	Ascorbic Acid mg	Vita-min D IU
Men	25	55	2,570	55	0.5	10	5,000	1.3	1.4	17	75	
	45	55	2,430	55	0.5	10	5,000	1.2	1.4	16	75	
	65	55	2,050	55	0.5	10	5,000	1.0	1.4	14	75	
Women	25	50	1,900	50	0.5	12	5,000	1.0	1.3	17	70	
	45	50	1,860	50	0.5	12	5,000	1.0	1.3	16	70	
	65	50	1,520	50	0.5	12	5,000	1.0	1.3	13	70	
	Pregnant (2d half)		+285	+20	1.0-1.2	15	6,000	1.1	1.8	+3	100	400
	Lactating		+950	+40	1.0-1.2	15	8,000	1.4	2.3	+2	150	400
Infants	0-1	(6)[4/]										
(Age in	2-6	(9)[4/]	kg x 115	See Foot-	0.5-0.6	5	1,500	0.3	0.4	5	30	400
months)	7-12		kg x 95	note 5/	0.5-0.6	7	1,500	0.4	0.5	6	30	400
Children	1-3		1,240	40	1.0	7	2,000	0.6	1.0	8	35	400
	4-6		1,620	50	1.0	8	2,500	0.8	1.3	11	50	400
	7-9		2,000	60	1.0	10	3,500	1.0	1.5	13	60	400
	10-12		2,380	70	1.2	12	4,500	1.2	1.8	16	75	400
Boys	13-15		2,950	85	1.4	15	5,000	1.5	2.1	19	90	400
	16-19		3,420	100	1.4	15	5,000	1.7	2.5	23	100	400
Girls	13-15		2,470	80	1.3	15	5,000	1.2	2.0	16	80	400
	16-19		2,280	75	1.3	15	5,000	1.1	1.9	15	80	400

1/ Estimated requirements of essential nutrients for individuals in Malaya, based on the recommendations of the Food and Nutrition Board, National Research Council, U.S.A. (1958; 3), and modified for local climatic conditions.

2/ IMR Report No. 64 (2). (References are given on p. 103.)

3/ Niacin equivalents include dietary sources of the preformed vitamin and the precursor tryptophan (60 mg tryptophan = 1 mg niacin).

4/ These figures represent ideal weights (in kg) for babies.

5/ Needs can be met by 3.5 gm/kg in first 6 months and 3 gm/kg for remainder of first year.

APPENDIX TABLE 38. HEIGHT AND WEIGHT BY SEX AND AGE (0-17 YEARS), CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Age (years)	<1	1	2	3	4	5	6	7
					Males			
Height (cm)								
No.	62	107	99	111	88	82	95	274
Mean	66.1	76.3	82.1	88.8	95.3	100.8	108.6	113.2
S.E.1/	0.8	0.5	0.7	0.6	0.7	0.7	0.7	0.4
Weight (kg)								
No.	63	108	100	113	88	82	95	274
Mean	7.0	9.2	10.7	12.2	13.8	15.3	17.2	18.6
S.E.	0.2	0.1	0.1	0.1	0.2	0.2	0.2	0.1
					Females			
Height (cm)								
No.	74	87	91	102	82	76	92	258
Mean	65.9	75.1	81.1	87.8	94.5	100.6	107.2	112.5
S.E.	0.7	0.6	0.6	0.7	0.8	0.7	0.6	0.4
Weight (kg)								
No.	75	87	94	103	84	76	92	258
Mean	6.8	8.7	10.1	11.8	13.9	14.6	16.6	18.1
S.E.	0.2	0.1	0.1	0.2	0.3	0.2	0.2	0.1

1/ S.E. = standard error.

APPENDIX TABLE 38 (Continued) HEIGHT AND WEIGHT BY SEX AND AGE (0-17 YEARS), CIVILIANS AND MILITARY DEPENDENTS, MALAYA

8	9	10	11	12	13	14	15	16	17
				Males					
164	238	323	263	237	62	42	50	61	44
117.4	121.6	126.5	131.0	135.7	140.4	150.2	155.9	161.7	160.9
0.4	0.4	0.3	0.4	0.5	0.9	1.4	1.1	1.0	1.0
164	238	323	263	237	62	42	50	61	44
20.1	21.7	24.2	26.6	29.0	32.4	39.6	44.7	50.6	51.2
0.2	0.2	0.2	0.2	0.3	0.6	1.3	1.0	1.0	1.0
				Females					
197	157	244	192	125	57	48	37	39	41
116.7	122.3	126.0	131.9	138.3	145.4	147.0	150.9	152.7	150.9
0.4	0.5	0.4	0.5	0.6	0.9	0.9	0.8	1.0	0.8
197	157	244	192	125	57	48	37	39	41
19.9	22.3	24.1	27.6	30.7	38.0	39.9	44.8	47.2	46.1
0.2	0.2	0.2	0.4	0.4	0.8	0.8	1.1	0.9	0.7

APPENDIX TABLE 39. CLINICAL FINDINGS BY SEX AND AGE, DETAILED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

	Males					Nonpregnant, Nonlactating Females					Preg-	Lacta-
Age (years)	5-9	10-14	15-44	45+	Total	5-9	10-14	15-44	45+	Total	nant	ting
Number	164	213	153	50	580	169	165	241	69	644	24	52
	Percent Prevalence											
Hair												
Depigmentation	2.4	0.5	--	--	0.9	30.0	0.6	1.2	5.8	2.0	--	--
Eyes												
Thickened opaque bulbar conjunctivae	0.6	3.3	17.0	26.0	8.1	0.6	0.6	8.7	29.0	6.7	--	3.8
Xerosis	--	0.5	--	--	0.2	--	0.6	2.5	1.4	1.2	4.2	1.9
Pingueculae	0.6	0.9	18.3	30.0	7.9	--	--	15.4	29.0	8.8	--	23.1
Bitot's spots	--	2.3	0.6	--	1.0	--	0.6	--	--	0.2	--	--
Circumcorneal injection	--	--	1.3	2.0	0.5	--	--	--	--	--	--	--
Conjunctival injection	0.6	1.9	1.3	10.0	2.1	1.8	2.4	0.4	2.9	1.6	--	--
Blepharitis	--	--	--	--	--	--	0.6	--	--	0.2	--	--
Skin, Face and Neck												
Nasolabial seborrhea	2.4	0.9	15.7	18.0	6.7	0.6	3.0	16.2	15.9	8.7	20.8	25.0
Other seborrhea	--	0.5	1.3	--	0.5	--	0.6	0.4	--	0.3	--	1.9
Pigmentation	--	--	0.6	--	0.2	--	--	0.8	1.4	0.5	--	--
Lips												
Angular lesions	1.2	1.4	2.6	--	1.6	1.2	0.6	0.4	--	0.6	--	--
Angular scars	6.1	13.1	5.9	12.0	4.3	3.0	9.1	10.0	10.1	7.9	16.7	5.8
Cheilosis	--	0.5	0.6	--	0.3	--	--	--	1.4	0.2	--	--
Gums												
Marginal redness	15.2	26.8	25.5	26.0	23.1	13.6	15.8	18.2	23.2	16.9	16.7	7.7
Marginal swelling	19.5	29.6	26.1	26.0	25.5	18.9	20.6	19.1	27.5	20.3	20.8	11.5
Atrophy of papillae	--	0.9	8.5	30.0	5.2	0.6	1.8	4.1	18.8	4.2	16.7	--
Recession	2.4	8.0	18.3	28.0	10.9	2.4	1.2	10.4	21.7	7.1	20.8	7.7
Swollen red papillae												
Localized	4.3	10.8	9.2	14.0	8.8	4.7	10.3	14.9	5.8	10.1	16.7	11.5
Diffuse	4.3	10.8	13.1	10.0	9.5	5.9	6.7	9.1	7.2	7.4	4.2	9.6
Bleeding gums	0.6	--	0.6	--	0.3	0.6	1.2	0.8	--	0.8	--	--

APPENDIX TABLE 39 (Continued) CLINICAL FINDINGS BY SEX AND AGE, DETAILED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

	Males					Nonpregnant, Nonlactating Females					Preg-nant	Lacta-ting
Age (years)	5-9	10-14	15-44	45+	Total	5-9	10-14	15-44	45+	Total		
Number	164	213	153	50	580	169	165	241	69	644	24	52
	Percent Prevalence											
Tongue												
Filiform papillary												
atrophy - Slight	3.0	0.9	0.6	4.0	1.7	4.1	--	1.2	7.2	2.3	--	3.8
Moderate/severe	1.2	--	--	--	0.3	0.6	1.2	0.4	1.4	0.8	4.2	--
Fungiform papillary												
atrophy - Slight	0.6	0.5	0.6	2.0	0.7	--	--	0.4	--	0.2	--	--
Moderate/severe	--	--	--	--	--	--	0.6	--	--	0.2	--	--
Papillary hypertrophy												
Slight	0.6	0.9	1.3	--	0.9	2.4	--	2.5	1.4	1.7	--	--
Moderate/severe	0.6	0.5	--	--	0.3	--	--	0.4	--	0.2	--	--
Geographic	0.6	0.9	--	--	0.5	0.6	--	1.6	1.4	0.9	8.3	1.9
Furrows	1.2	1.4	4.6	10.0	2.9	0.6	1.2	3.7	4.3	2.3	8.3	3.8
Fissures	0.6	0.9	0.6	2.0	0.9	--	1.2	0.8	1.4	0.8	--	--
Serrations	--	--	1.3	--	0.3	--	0.2	2.1	1.4	1.1	--	1.9
Red, tip and/or												
lateral margins	--	--	0.6	2.0	0.3	--	--	1.6	1.4	0.8	--	--
Glossitis	--	--	0.6	--	0.2	--	--	0.4	--	0.2	--	--
Magenta colored	--	--	0.6	--	0.2	--	--	--	--	--	--	--
Clands												
Parotid enlarged	--	0.5	--	--	0.2	--	--	--	--	--	4.2	--
Thyroid enlarged	--	4.2	3.3	--	2.4	5.3	14.5	12.9	13.0	11.3	25.0	26.9
Skin, General												
Follicular hyperkeratosis												
Anywhere	4.3	0.9	0.6	2.0	1.9	1.2	1.8	0.4	--	0.9	4.2	1.9
Arms - Slight	--	0.5	--	--	0.2	0.6	1.2	--	--	0.5	--	--
Moderate/severe	0.6	0.5	--	2.0	0.5	0.6	--	--	--	0.2	--	--
Back - Slight	1.8	--	0.6	2.0	0.9	--	--	--	--	--	4.2	1.9
Moderate/severe	0.6	0.5	--	--	0.3	0.6	--	--	--	0.2	--	--

APPENDIX TABLE 39 (Continued) CLINICAL FINDINGS BY SEX AND AGE, DETAILED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

	Males					Nonpregnant, Nonlactating Females					Preg-	Lacta-
Age (years)	5-9	10-14	15-44	45+	Total	5-9	10-14	15-44	45+	Total	nant	ting
Number	164	213	153	50	580	169	165	241	69	644	24	52
						Percent Prevalence						
Skin, General (continued)												
Follicular hyperkeratosis (continued)												
Chest - Slight	1.8	0.5	--	--	0.7	--	--	0.4	--	0.2	--	1.9
Moderate/severe	--	0.5	--	2.0	0.3	--	0.6	--	--	0.2	--	--
Thighs - Slight	--	0.5	--	2.0	0.3	--	0.6	--	--	0.2	--	--
Moderate/severe	0.6	--	--	--	0.2	0.6	--	--	--	0.2	--	--
Buttocks - Slight	--	--	--	2.0	0.2	--	--	--	--	--	--	--
Moderate/severe	--	--	--	--	--	0.6	--	--	--	0.2	--	--
Perifolliculosis	--	--	0.6	--	0.2	--	--	--	1.4	0.2	--	--
Xerosis	1.2	6.6	7.2	10.0	5.5	2.4	3.0	1.6	5.8	2.6	--	--
Crackled skin	3.6	3.3	4.6	12.0	4.5	1.8	3.6	2.9	5.8	3.1	--	--
Acneform eruption	--	--	2.0	--	0.5	--	--	0.4	--	0.2	--	--
Thickened pressure points	--	--	--	4.0	0.3	--	--	--	--	--	--	--
Purpura or petechiae	--	--	--	2.0	0.2	--	--	--	--	--	--	--
Hyperpigmentation of hands	--	--	0.6	4.0	0.5	--	--	--	--	--	--	--
Abdomen												
Hepatomegaly	1.8	0.5	--	4.0	1.0	1.2	1.8	1.2	2.9	1.6	--	3.8
Splenomegaly	0.6	0.5	--	2.0	0.5	0.5	--	0.8	--	0.5	--	--
Lower Extremities												
Bilateral edema	--	--	1.3	6.0	0.9	--	--	0.4	7.2	0.9	4.2	--
Loss of ankle jerk												
Bilateral	1.2	1.4	2.6	16.0	2.9	4.1	1.2	1.2	17.4	3.7	4.2	1.9
Calf tenderness	--	--	2.0	--	0.5	0.6	0.6	0.8	5.8	1.2	--	--
Loss of knee jerk												
Bilateral	1.8	1.9	1.3	14.0	2.8	3.0	2.4	2.5	13.0	3.7	4.2	5.8

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APPENDIX TABLE 40. CLINICAL FINDINGS BY LOCATION, DETAILED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Location	Males and Females, 5-14 Years								
	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
Number	99	71	64	82	200	105	--	90	711
	Percent Prevalence								
Hair									
Depigmentation	1.0	--	1.6	1.2	2.0	--		4.4	1.5
Eyes									
Thickened opaque bulbar conjunctivae	1.0	4.2	--	--	0.5	--		5.6	1.4
Xerosis	1.0	--	--	--	--	--		1.1	0.3
Pingueculae	2.0	--	--	--	0.5	--		--	0.4
Bitot's spots	--	4.2	--	1.2	--	1.0		1.1	0.8
Circumcorneal injection	--	--	--	--	--	--		--	--
Conjunctival injection	--	--	--	--	3.5	--		5.6	1.7
Blepharitis	1.0	--	--	--	--	--		--	0.1
Skin, Face and Neck									
Nasolabial seborrhea	3.0	2.8	--	1.2	2.0	--		2.2	1.7
Other seborrhea	--	2.8	--	--	--	--		--	0.3
Pigmentation	--	--	--	--	--	--		--	--
Lips									
Angular lesions	--	1.4	1.6	--	2.5	--		1.1	1.1
Angular scars	2.0	18.3	--	--	20.0	1.0		2.2	8.2
Cheilosis	--	1.4	--	--	--	--		--	0.1
Gums									
Marginal redness	18.2	38.0	3.1	--	4.0	18.1		63.3	18.4
Marginal swelling	20.2	53.5	4.7	--	5.0	27.6		67.8	22.6
Atrophy of papillae	3.0	--	--	--	--	2.8		--	0.8
Recession	3.0	11.3	--	--	3.5	2.8		6.7	3.8
Swollen red papillae									
Localized	13.1	11.3	10.9	4.9	3.5	6.7		10.0	7.7
Diffuse	3.0	21.1	6.2	--	3.0	3.8		21.1	7.2
Bleeding gums	1.0	--	--	1.2	--	1.9		--	0.6
Tongue									
Filiform papillary atrophy									
Slight	--	2.8	--	3.6	2.5	1.9		2.2	2.0
Moderate/severe	1.0	1.4	--	--	1.0	--		1.1	0.7
Fungiform papillary atrophy									
Slight	--	1.4	--	--	--	--		1.1	0.3
Moderate/severe	--	1.4	--	--	--	--		--	0.1
Papillary hypertrophy									
Slight	--	1.4	4.7	--	--	--		3.3	1.0
Moderate/severe	--	1.4	--	--	0.5	--		--	0.3
Geographic	--	--	--	--	--	--		4.4	0.6

APPENDIX TABLE 40 (Continued) CLINICAL FINDINGS BY LOCATION, DETAILED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Males and Nonpregnant, Nonlactating Females, 15+ Years

Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
98	104	106	33	80	46	6	40	513
			Percent Prevalence					
--	1.0	1.9	--	1.2	6.5	--	--	1.4
13.3	20.2	9.4	--	26.2	6.5	--	30.0	15.6
--	--	6.6	--	--	--	--	--	1.4
18.4	1.9	20.8	21.2	31.2	37.0	33.3	17.5	19.5
--	--	0.9	--	--	--	--	--	0.2
--	1.0	0.9	--	1.2	--	--	--	0.6
--	1.9	2.8	--	3.8	2.2	--	2.5	1.9
--	--	--	--	--	--	--	--	--
20.4	9.6	19.8	3.0	15.0	10.9	16.7	32.5	16.2
--	1.9	--	--	--	2.2	--	--	0.6
--	1.0	--	--	1.2	4.3	--	--	0.8
--	2.9	--	--	1.2	2.2	--	--	1.0
3.1	17.3	--	--	30.0	--	--	2.5	9.0
--	1.0	--	--	1.2	--	--	--	0.4
25.5	36.5	12.3	--	17.5	21.7	--	30.0	21.8
26.5	32.7	15.1	--	15.0	30.4	16.7	37.5	23.0
15.3	8.6	10.4	--	6.2	13.0	--	12.5	9.9
23.5	18.3	17.0	3.0	7.5	17.4	--	17.5	16.0
10.2	21.2	9.4	--	10.0	17.4	--	7.5	11.9
9.2	17.3	4.7	--	15.0	6.5	--	12.5	10.1
--	1.0	--	--	1.2	2.2	--	--	0.6
2.0	1.9	0.9	3.0	2.5	2.2	--	5.0	2.1
--	--	0.9	--	--	--	--	2.5	0.4
1.0	--	--	--	--	--	--	5.0	0.6
--	--	--	--	--	--	--	--	--
--	4.8	--	--	1.2	--	--	7.5	1.8
--	1.0	--	--	--	--	--	--	0.2
--	1.0	--	--	2.5	--	--	5.0	1.0

APPENDIX TABLE 40 (Continued) CLINICAL FINDINGS BY LOCATION, DETAILED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

	Males and Females, 5-14 Years								
Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
Number	99	71	64	82	200	105	--	90	711
					Percent Prevalence				
<u>Tongue</u> (continued)									
Furrows	2.0	2.8	--	--	1.5	--		1.1	1.1
Fissures	--	--	--	6.1	--	--		--	0.7
Serrations	--	--	--	--	0.5	--		--	0.1
Red, tip and/or lateral margins	--	--	--	--	--	--		--	--
Glossitis	--	--	--	--	--	--		--	--
Magenta colored	--	--	--	--	--	--		--	--
<u>Glands</u>									
Parotid enlarged	--	--	1.6	--	--	--		--	0.1
Thyroid enlarged	12.1	5.6	1.6	4.9	7.5	3.8		2.2	5.9
<u>Skin, General</u>									
Follicular hyperkeratosis									
Anywhere	2.0	--	--	2.4	1.5	1.9		5.6	2.0
Arms - Slight	1.0	--	--	2.4	0.5	--		--	0.6
Moderate/severe	1.0	--	--	--	0.5	--		1.1	0.4
Back - Slight	--	--	--	--	0.5	--		2.2	0.4
Moderate/severe	1.0	--	--	--	0.5	--		1.1	0.4
Chest - Slight	--	--	--	--	0.5	1.9		1.1	0.6
Moderate/severe	--	--	--	--	--	--		2.2	0.3
Thighs - Slight	--	--	--	1.2	0.5	--		--	0.3
Moderate/severe	1.0	--	--	--	0.5	--		--	0.3
Buttocks - Slight	--	--	--	--	--	--		--	--
Moderate/severe	--	--	--	--	0.5	--		--	0.1
Perifolliculosis	--	--	--	--	--	--		--	--
Xerosis	1.0	11.3	1.6	2.4	0.5	--		13.3	3.5
Crackled skin	2.0	--	3.1	--	6.0	--		6.7	3.1
Acneform eruption	--	--	--	--	--	--		--	--
Thickened pressure points	--	--	--	--	--	--		--	--
Purpura or petechiae	--	--	--	--	--	--		--	--
Hyperpigmentation of hands	--	--	--	--	--	--		--	--
<u>Abdomen</u>									
Hepatomegaly	1.0	1.4	3.1	2.4	0.5	1.9		--	1.3
Splenomegaly	--	1.4	--	--	--	1.9		--	0.4
<u>Lower Extremities</u>									
Bilateral edema	--	--	--	--	--	--		--	--
Loss of ankle jerk									
Bilateral	1.0	2.8	1.6	--	2.5	2.8		2.2	2.0
Calf tenderness	--	1.4	--	--	0.5	--		--	0.3
Loss of knee jerk									
Bilateral	2.0	4.2	1.6	--	2.5	2.8		2.2	2.2

APPENDIX TABLE 40 (Continued) CLINICAL FINDINGS BY LOCATION, DETAILED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Males and Nonpregnant, Nonlactating Females, 15+ Years

Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
98	104	106	33	80	46	6	40	513
			Percent Prevalence					
3.1	8.6	1.9	--	8.8	--	--	7.5	4.7
--	1.0	1.9	3.0	1.2	--	--	--	1.0
1.0	1.9	--	--	6.2	--	--	--	1.6
--	1.0	2.8	3.0	2.5	--	--	--	1.4
1.0	1.0	--	--	--	--	--	--	0.4
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--
13.3	6.7	2.8	9.1	12.5	10.9	--	10.0	8.8
1.0	--	0.9	--	--	--	--	2.5	0.6
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	2.5	0.2
--	--	0.9	--	--	--	--	2.5	0.4
--	--	--	--	--	--	--	--	--
1.0	--	--	--	--	--	--	--	0.2
--	--	--	--	--	--	--	2.5	0.2
--	--	--	--	--	--	--	2.5	0.2
--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	2.5	0.2
--	--	--	--	--	--	--	--	--
2.0	--	--	--	--	--	--	--	0.4
--	8.6	10.4	--	2.5	2.2	16.7	--	4.7
2.0	1.9	15.1	--	3.8	--	--	2.5	4.7
--	2.9	--	--	1.2	--	--	--	0.8
--	--	0.9	--	--	--	--	2.5	0.4
1.0	--	--	--	--	--	--	--	0.2
1.0	--	--	--	2.5	--	--	--	0.6
1.0	1.0	1.9	--	2.5	2.2	--	--	1.4
--	1.9	0.9	--	--	--	--	--	0.6
6.1	--	--	--	6.2	--	--	--	2.1
4.1	1.0	6.6	18.2	3.8	2.2	--	12.5	5.3
3.1	2.9	--	--	2.5	2.2	--	--	1.8
4.1	1.0	3.8	21.2	5.0	2.2	--	7.5	4.7

APPENDIX TABLE 41. SELECTED CLINICAL FINDINGS BY EXAMINER, ABBREVIATED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Examiner	1	3	4	6	7	8	9	Total
			Males and Females, 5-14 Years					
Number	355	572	341	989	704	25	365	3,351
			Percent Prevalence					
Eyes								
Bitot's spots	0.6	0.2	0.3	0.2			1.6	0.4
Skin, Face and Neck								
Nasolabial seborrhea	0.3	1.0	1.8	0.2	0.1		0.3	0.5
Lips								
Angular lesions	2.8	1.6	1.2	2.2	1.8		1.4	1.9
Angular scars	8.4	3.8	4.4	5.6	3.4		7.9	5.2
Cheilosis	0.6	0.3						0.1
Gums								
Swollen red papillae								
Localized	0.6	8.7	3.2	7.7	7.2		14.8	8.3
Diffuse	18.3	16.4	0.6	13.8	5.8		24.6	12.8
Tongue								
Filiform papillary atrophy								
Slight	3.1	1.7	2.0	0.5	1.8		0.8	1.5
Moderate/severe	0.6	0.5	0.3	1.0	0.3		0.5	0.6
Glossitis	0.6				0.3			0.1
Magenta colored	1.4	0.7					0.3	0.3
Glands								
Thyroid enlarged								
Grade I	4.8	5.9	3.8	2.6	3.0		3.6	3.7
Grades II and III					0.1			0.03
Skin, General								
Follicular hyperkeratosis								
Anywhere	1.1	0.3	0.3	0.5	0.8		1.4	0.7
Arms	1.1	0.3	0.3	0.4	0.4		1.4	0.6
Back	0.3			0.4	0.6		0.8	0.4
Thighs				0.2	0.4		0.8	0.2

APPENDIX TABLE 41 (Continued) SELECTED CLINICAL FINDINGS BY EXAMINER, ABBREVIATED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Examiner Number	1	3	4	6	7	8	9	Total
	Males and Females, 5-14 Years (continued)							
Number	355	572	341	989	704	25	365	3,351
	Percent Prevalence							
Lower Extremities								
Bilateral edema					0.6			0.1
Loss of ankle jerk								
Unilateral	0.6	0.9	3.5	0.8	1.7			1.2
Bilateral	3.7	0.7	3.8	2.4	3.8			2.4
Calf tenderness					2.1			0.4
	Males and Nonpregnant, Nonlactating Females, 15+ Years							
Number	371	374	152	614	322	41	340	2,214
	Percent Prevalence							
Eyes								
Bitot's spots	0.3				0.3			0.1
Skin, Face and Neck								
Nasolabial seborrhea	4.8	12.0	17.1	8.0	12.7	7.3	1.5	8.4
Lips								
Angular lesions	1.6	4.8	3.3	0.3	1.9		1.5	1.9
Angular scars	8.1	3.5	2.0	7.2	3.1		7.9	5.7
Cheilosis		0.3						0.04
Gums								
Swollen red papillae								
Localized	13.7	9.1	3.9	6.2	6.2		14.7	9.0
Diffuse	15.1	14.2		14.0	14.3	2.4	19.7	14.0
Tongue								
Filiform papillary atrophy								
Slight	0.8	2.9	2.0	2.3	1.2	7.3	1.5	1.9
Moderate/severe	0.5	1.6		1.1	2.2		1.5	1.2
Glossitis	1.3		1.3	0.2				0.4
Magenta colored	4.3	0.5		0.8			2.6	1.4

APPENDIX TABLE 41 (Continued) SELECTED CLINICAL FINDINGS BY EXAMINER, ABBREVIATED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Examiner Number	1	3	4	6	7	8	9	Total
	Males and Nonpregnant, Nonlactating Females, 15+ Years (continued)							
Number	371	374	152	614	322	41	340	2,214
	Percent Prevalence							
Glands								
Thyroid enlarged								
Grade I	14.5	9.6	7.2	13.5	3.7	2.4	4.1	9.5
Grades II and III		1.3		0.2	0.3			0.3
Skin, General								
Follicular hyperkeratosis								
Anywhere	0.8	1.6	2.0	0.5	0.9			0.8
Arms	0.8	1.6	2.0	0.2	0.6			0.7
Back	0.5	0.5	0.6	0.5	0.3			0.4
Thighs	0.3	0.8		0.2	0.6			0.3
Lower Extremities								
Bilateral edema	0.5	1.3	2.0		2.8			0.8
Loss of ankle jerk								
Unilateral	0.5	0.8	3.3	3.9	2.2			1.9
Bilateral	19.1	5.1	5.9	8.8	12.4	2.4	0.9	8.9
Calf tenderness		1.1	0.6	0.2	2.5			0.6

				Pregnant and Lactating Women				
Examiner Number	1	3	4	5, 6	7	8	9	Total
Number	69	52	51	53	76	4	43	348
	Percent Prevalence							
Skin, Face and Neck								
Nasolabial seborrhea		21.2	31.4	3.8	6.6		2.3	10.0
Lips								
Angular lesions	4.3	1.9					4.6	1.7
Angular scars	10.1			5.7	1.3		2.3	3.4
Gums								
Swollen red papillae								
Localized	14.5	11.5	3.9	13.2	13.2		11.6	11.5
Diffuse	10.1	21.2		9.4	11.8		27.9	12.6

APPENDIX TABLE 41 (Continued) SELECTED CLINICAL FINDINGS BY EXAMINER, ABBREVIATED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Examiner Number	1	3	4	5, 6	7	8	9	Total
Number	69	52	51	53	76	4	43	348
				Percent Prevalence				
Tongue								
Filiform papillary atrophy								
Slight	1.4	7.7	9.8		3.9			3.7
Moderate/severe	1.4			3.8	1.3		2.3	1.4
Magenta colored							2.3	0.3
Glands								
Thyroid enlarged								
Grade I	23.2	9.6	27.4	24.5	13.2		9.3	17.8
Grades II and III				1.9				0.3
Skin, General								
Follicular hyperkeratosis								
Anywhere				3.8				0.6
Arms								--
Back								--
Thighs				3.8				0.6
Lower Extremities								
Bilateral edema		3.8	3.9	1.9	2.6			2.0
Loss of ankle jerk								
Unilateral			2.0					0.3
Bilateral	4.3			1.9	3.9		2.3	2.3
Calf tenderness					2.6			0.6

APPENDIX TABLE 42. CLINICAL FINDINGS BY EXAMINER, DETAILED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Examiner Number	1	4	6	7	8	9	3 and 5	Total
	Males and Females, 5-14 Years							
Number	31	194	100	276	73	26	11	711
	Percent Prevalence							
Hair								
Depigmentation		2.1	1.0	1.4	2.7			1.5
Eyes								
Thickened opaque bulbar conjunctivae		1.0		2.9				1.4
Xerosis		0.5		0.4				0.3
Pingueculae		0.5	2.0					0.4
Bitot's spots				1.4	1.4		9.1	0.8
Circumcorneal injection								--
Conjunctival injection		0.5	1.0	1.8		19.2		1.7
Blepharitis		0.5						0.1
Skin, Face and Neck								
Nasolabial seborrhea		3.6		1.4	1.4			1.7
Other seborrhea				0.7				0.3
Pigmentation								--
Lips								
Angular lesions	3.2	1.0		1.1	1.4	3.8		1.1
Angular scars		17.0	2.0	7.2		7.7	9.1	8.2
Cheilosis				0.4				0.1
Gums								
Marginal redness	16.1	1.0		44.6			9.1	18.4
Marginal swelling	9.7	1.5		55.8			9.1	22.6
Atrophy of papillae			1.0	1.8				0.8
Recession	3.2			6.9		26.9		3.8
Swollen red papillae								
Localized	6.4	2.6	10.0	11.6	5.5	7.7		7.7
Diffuse	25.8		4.0	13.4		7.7		7.2
Bleeding gums		1.0		0.4	1.4			0.6

APPENDIX TABLE 42 (Continued) CLINICAL FINDINGS BY EXAMINER, DETAILED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Examiner Number	1	4	6	7	8	9	3 and 5	Total
	Males and Females, 5-14 Years (continued)							
Number	31	194	100	276	73	26	11	711
	Percent Prevalence							
Tongue								
Filiform papillary atrophy								
Slight		2.6		1.8	4.1		9.1	2.0
Moderate/severe			1.0	0.7		7.7		0.7
Fungiform papillary atrophy								
Slight				0.7				0.3
Moderate/severe				0.4				0.1
Papillary hypertrophy								
Slight			3.0	1.4				1.0
Moderate/severe		0.5		0.4				0.3
Geographic				1.4				0.6
Furrows		1.0	1.0	1.4		3.8		1.1
Fissures					6.8			0.7
Serrations		0.5						0.1
Red, tip and/or lateral margins								--
Glossitis								--
Magenta colored								--
Glands								
Parotid enlarged			1.0					0.1
Thyroid enlarged		9.3	6.0	4.7	5.5	3.8		5.9
Skin, General								
Follicular hyperkeratosis								
Anywhere		1.5		3.3	2.7			2.0
Arms - Slight		0.5		0.4	2.7			0.6
Moderate/severe		0.5		0.7				0.4
Back - Slight		0.5		0.7				0.4
Moderate/severe		0.5		0.7				0.4
Chest - Slight		0.5		1.1				0.6
Moderate/severe				0.7				0.3

APPENDIX TABLE 42 (Continued) CLINICAL FINDINGS BY EXAMINER, DETAILED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Examiner Number	1	4	6	7	8	9	3 and 5	Total
	Males and Females, 5-14 Years (continued)							
Number	31	194	100	276	73	26	11	711
	Percent Prevalence							
Skin, General (continued)								
Follicular hyperkeratosis (continued)								
Thighs - Slight		0.5			1.4			0.3
Moderate/severe		0.5		0.4				0.3
Buttocks - Slight								--
Moderate/severe		0.5						0.1
Perifolliculosis								--
Xerosis		0.5	1.0	7.6	2.7			3.5
Crackled skin		7.2	3.0	1.8				3.1
Acneform eruption								--
Thickened pressure points								--
Purpura or petechiae								--
Hyperpigmentation of hands								--
Abdomen								
Hepatomegaly		1.5	4.0		1.4		9.1	1.3
Splenomegaly				0.4			18.2	0.4
Lower Extremities								
Bilateral edema								--
Loss of ankle jerk								
Bilateral	3.2	2.6	1.0	2.2		3.8		2.0
Calf tenderness				0.7				0.3
Loss of knee jerk								
Bilateral		2.6	1.0	3.6				2.2

APPENDIX TABLE 42 (Continued) CLINICAL FINDINGS BY EXAMINER, DETAILED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Examiner Number	1	3	4	6	7	8	5 and 9	Total
	Males and Nonpregnant, Nonlactating Females, 15+ Years							
Number	28	27	118	73	208	55	4	513
	Percent Prevalence							
Hair								
Depigmentation		3.7	2.5	4.1				1.4
Eyes								
Thickened opaque bulbar conjunctivae	7.1		5.9		34.1			15.6
Xerosis	3.6					10.9		1.4
Pingueculae	7.1	11.1	27.1	57.5	7.7	7.3	25.0	19.5
Bitot's spots	3.6							0.2
Circumcorneal injection					1.4			0.6
Conjunctival injection	3.6				4.3			1.9
Skin, Face and Neck								
Nasolabial seborrhea	10.7	14.8	24.6	16.4	12.5	16.4		16.2
Other seborrhea			0.8		1.0			0.6
Pigmentation			2.5		0.5			0.8
Lips								
Angular lesions		3.7			1.4		25.0	1.0
Angular scars	3.6	18.5	15.2		10.1		25.0	9.0
Cheilosis			0.8		0.5			0.4
Gums								
Marginal redness	14.3		2.5		50.5			21.8
Marginal swelling	25.0	3.7	3.4	1.4	50.5			23.0
Atrophy of papillae	17.8		2.5		20.7			9.9
Recession	25.0	7.4	2.5	9.6	30.3			16.0
Swollen red papillae								
Localized	17.8	29.6	7.6	8.2	15.9			11.9
Diffuse	10.7	7.4	6.8	5.5	16.8			10.1
Bleeding gums			1.7		0.5			0.6

APPENDIX TABLE 42 (Continued) CLINICAL FINDINGS BY EXAMINER, DETAILED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Examiner Number	1	3	4	6	7	8	5 and 9	Total
	Males and Nonpregnant, Nonlactating Females, 15+ Years (continued)							
Number	28	27	118	73	208	55	4	513
	Percent Prevalence							
Tongue								
Filiform papillary atrophy								
Slight	3.6	7.4	1.7	1.4	2.4			2.1
Moderate/severe				1.4	0.5			0.4
Fungiform papillary atrophy								
Slight			0.8		1.0			0.6
Papillary hypertrophy								
Slight		3.7			3.8			1.8
Moderate/severe					0.5			0.2
Geographic					2.4			1.0
Furrows		3.7	5.9	2.7	6.2	1.8		4.7
Fissures			0.8		0.5	5.4		1.0
Serrations			4.2		1.0		25.0	1.6
Red, tip and/or lateral margins		3.7		6.8	0.5			1.4
Glossitis					1.0			0.4
Glands								
Thyroid enlarged	7.1	14.8	10.2	9.6	7.7	7.3		8.8
Skin, General								
Follicular hyperkeratosis								
Anywhere			0.8		1.0			0.6
Arms								
Moderate/severe			0.8					0.2
Back - Slight			0.8		0.5			0.4
Chest - Slight					0.5			0.2
Moderate/severe			0.8					0.2
Thighs - Slight			0.8					0.2
Buttocks - Slight			0.8					0.2
Perifolliculosis					1.0			0.4

APPENDIX TABLE 42 (Continued) CLINICAL FINDINGS BY EXAMINER, DETAILED EXAMINATIONS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Examiner Number	1	3	4	6	7	8	5 and 9	Total
	Males and Nonpregnant, Nonlactating Females, 15+ Years (continued)							
Number	28	27	118	73	208	55	4	513
	Percent Prevalence							
Skin, General (continued)								
Xerosis	7.1	3.7	1.7	1.4	7.7	3.6		4.7
Crackled skin	7.1		3.4	19.2	1.9			4.7
Acneform eruption			0.8		1.4			0.8
Thickened pressure points	3.6		0.8					0.4
Purpura or petechiae			0.8					0.2
Hyperpigmentation of hands			2.[illegible]					0.6
Abdomen								
Hepatomegaly		3.7	1.7	2.[illegible]	1.0			1.4
Splenomegaly	3.6	7.4						0.6
Lower Extremities								
Bilateral edema		3.7	5.1	1.4	1.4			2.1
Loss of ankle jerk								
Bilateral	3.6		2.5	9.6	6.2	5.4		5.3
Calf tenderness			0.8		3.8			1.8
Loss of knee jerk								
Bilateral	7.1		1.7	6.8	5.8	5.4		4.8

APPENDIX TABLE 43. FREQUENCY DISTRIBUTION OF BLOOD PRESSURE BY SEX AND AGE, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Age (years)	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+	Total
Number	27	957	242	111	69	69	63	77	63	56	75	55	68	1,932
mm Hg						Males - Systolic								
70-78	2	7												9
80-88	7	70							1			2		80
90-98	9	219	6	1	1	1	1	2	2	1	1	1		245
100-108	6	324	23	6	7	4	7	10	8	3	6	2	4	410
110-118	2	238	48	15	10	13	13	16	5	7	8	9	7	391
120-128		67	64	33	17	16	13	14	17	10	13	9	11	284
130-138	1	23	55	26	17	18	12	8	10	14	21	7	10	222
140-148		8	35	21	8	11	12	14	9	9	8	8	7	150
150-158		1	8	7	7	4	2	8	4	2	7	5	13	68
160-168			3	1	2	1		2	4	4	7	7	4	35
170-178						1	2	1	1	3	3		3	14
180-188							1	1				1	5	8
190-198								1	1	1	1	1	1	6
200-208												2	1	3
210-218										1				1
220-228									1	1		1		3
230-238													1	1
240-248													1	1
250-258				1										1
Mean	95.2	104.6	125.7	130.1	128.4	128.8	127.7	129.4	131.1	136.9	135.3	138.4	145.2	117.4
S.E.1/	2.5	0.4	0.9	1.7	1.9	1.8	2.3	2.4	3.0	3.4	2.3	3.9	3.5	0.5

1/ S.E. = standard error.

APPENDIX TABLE 43 (Continued) FREQUENCY DISTRIBUTION OF BLOOD PRESSURE BY SEX AND AGE, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Age (years)	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+	Total
Number	27	957	242	111	69	69	63	77	63	56	75	55	68	1,932
mm Hg						Males - Diastolic (change of sound in tone)								
30-38		3										1		4
40-48	1	16												17
50-58	2	138	3	1	1	2		1				1		149
60-68	15	330	40	5	4	2	2	3	3	4	3	2	7	420
70-78	7	325	80	23	19	12	11	18	16	13	15	18	17	574
80-88	2	124	84	46	25	25	29	33	17	11	26	15	14	451
90-98		19	29	33	12	21	15	9	18	16	22	9	14	217
100-108		2	6	2	5	4	4	4	7	4	5	6	10	59
110-118				1	3	3	2	8	1	5	4	1	3	31
120-128								1	1	2		2	2	8
130-138										1			1	2
Mean	64.6	67.9	78.0	83.6	83.0	85.6	84.8	85.6	86.2	89.2	85.8	84.1	86.9	75.5
S.E.	1.6	0.3	0.6	0.9	1.5	1.4	1.3	1.6	1.5	2.2	1.3	2.1	2.0	0.3
						Males - Diastolic (disappearance of sound)								
mm Hg														
0-18		6												6
20-28		4							1			1		6
30-38	1	14												15
40-48	3	70	1		1							1		76
50-58	4	219	17	4	3	2	1	1		2	2	1	2	258
60-68	14	326	62	16	7	6	7	10	7	6	7	11	10	489
70-78	5	238	94	30	27	21	22	26	18	13	23	17	15	549
80-88		69	52	46	20	27	21	24	17	16	21	12	20	345
90-98		10	13	14	6	8	9	6	14	11	16	4	11	122
100-108		1	3	1	4	4	2	6	4	2	4	5	5	41
110-118					1	1	1	4	1	4	2	1	2	17
120-128									1	2		2	2	7
130-138													1	1
Mean	59.1	62.5	72.5	78.6	78.5	80.5	79.8	80.8	81.7	85.1	81.7	78.7	82.5	70.3
S.E.	2.0	0.4	0.7	1.0	1.5	1.4	1.4	1.5	1.9	2.1	1.4	2.4	2.0	0.3

APPENDIX TABLE 43 (Continued) FREQUENCY DISTRIBUTION OF BLOOD PRESSURE BY SEX AND AGE, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Age (years)	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+	Total
Number	30	676	223	248	129	124	87	106	71	92	51	60	63	1,960
mm Hg	Nonpregnant, Nonlactating Females - Systolic													
60-68		1												1
70-78		5												5
80-88	12	39			2	1								54
90-98	4	108	6	8	6	2	4	8	1			2	1	150
100-108	8	183	33	43	20	19	9	12	6	3	1	5	4	346
110-118	5	184	48	62	38	32	22	19	8	19	6	3	1	447
120-128		106	68	72	30	30	21	32	12	19	9	8	7	414
130-138	1	38	44	38	13	25	12	10	17	12	11	9	8	238
140-148		9	18	18	15	11	12	13	8	16	8	15	11	154
150-158		3	4	5	2	2	4	8	10	6	9	3	3	59
160-168			2	2	3	1	3	1	5	3	4	8	6	38
170-178						1		2	1	5	1	3	5	18
180-188								1	2	6	1	1		11
190-198										2			5	7
200-208									1	1		2	3	7
210-218													2	2
220-228													1	1
230-238											1		4	5
240-248													1	1
250-258														--
260-268												1		1
270-278													1	1
Mean	96.5	108.7	121.8	120.6	120.3	122.0	124.7	124.7	135.4	137.3	139.8	142.1	160.1	120.5
S.E.	2.5	0.5	0.9	0.9	1.4	1.3	1.8	1.8	2.8	2.5	3.1	3.7	5.1	0.5

APPENDIX TABLE 43 (Continued) FREQUENCY DISTRIBUTION OF BLOOD PRESSURE BY SEX AND AGE, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Age (years)	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65+	Total
Number	30	676	223	248	129	124	87	106	71	92	51	60	63	1,960
Nonpregnant, Nonlactating Females - Diastolic (change of sound in tone)														
mm Hg														
0-18		2												2
20-28		2												2
30-38		1												1
40-48	1	6												7
50-58	3	49	2	1	1	1		1					2	60
60-68	10	171	22	41	15	14	6	12	2	3		3	2	301
70-78	7	260	81	82	36	38	14	18	17	20	8	14	10	605
80-88	8	149	91	74	50	43	38	38	21	30	25	21	20	608
90-98	1	33	21	39	19	19	22	27	20	24	9	12	9	255
100-108		3	5	9	6	7	5	9	10	9	4	7	6	80
110-118			1			2	1	1		4	5		6	20
120-128				1	2		1		1	2		3	7	17
130-138				1									1	2
Mean	68.5	71.7	78.7	79.2	80.9	81.0	84.6	83.3	86.6	86.9	87.6	86.5	91.5	78.5
S.E.	2.2	0.4	0.6	0.7	1.0	1.0	1.2	1.1	1.4	1.3	1.6	1.8	2.4	0.3
Nonpregnant, Nonlactating Females - Diastolic (disappearance of sound)														
mm Hg														
0-8		6												6
10-18														--
20-28	1	3												4
30-38		6			1									7
40-48	2	22	2	1				1						28
50-58	5	102	6	12	3	7	1	3				2	2	143
60-68	10	221	46	74	26	23	10	18	8	7	4	5	7	459
70-78	9	207	100	76	44	42	24	29	17	28	13	19	18	626
80-88	2	89	62	53	40	35	34	28	20	37	21	19	10	450
90-98	1	18	5	28	11	12	13	21	17	12	6	8	12	164
100-108		2	2	2	2	4	4	5	8	5	5	4	5	48
110-118				1	1	1	1	1		2	2	1	1	11
120-128				1	1				1	1		2	8	14
Mean	62.9	66.6	73.8	74.5	76.5	76.6	79.9	79.0	82.9	82.0	83.5	81.8	85.9	73.8
S.E.	2.5	0.5	0.6	0.8	1.0	1.1	1.2	1.2	1.5	1.2	1.7	1.8	2.4	0.3

APPENDIX TABLE 43 (Continued) FREQUENCY DISTRIBUTION OF BLOOD PRESSURE BY SEX AND AGE, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

	Pregnant						Lactating					
Age (years)	15-19	20-24	25-29	30-34	35+	Total	15-19	20-24	25-29	30-34	35+	Total
Number	20	61	43	16	12	152	18	89	49	25	13	194
						Females - Systolic						
mm Hg												
80-88			1	1		2		1				1
90-98		4	1		1	6	1		1		1	3
100-108	3	14	6	3	3	29		18	11	4	1	34
110-118	12	20	13	6	4	55	7	28	11	7	6	59
120-128	4	17	14	5	2	42	8	25	17	8	3	61
130-138	1	5	3	1	1	11	1	10	7	3		21
140-148		1	4		1	6	1	5	1	2	2	11
150-158						--			1			1
160-168			1			1		1				1
170-178						--		1				1
180-188						--				1		1
Mean	116.8	115.3	120.0	113.2	115.9	116.6	119.4	119.5	118.4	122.3	118.1	119.5

APPENDIX TABLE 43 (Continued) FREQUENCY DISTRIBUTION OF BLOOD PRESSURE BY SEX AND AGE, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

	Pregnant						Lactating					
Age (years)	15-19	20-24	25-29	30-34	35+	Total	15-19	20-24	25-29	30-34	35+	Total
Number	20	61	43	16	12	152	18	89	49	25	13	194
	Females - Diastolic (change of sound in tone)											
mm Hg												
40-48		1				1						--
50-58		3	2	1	1	7			3			3
60-68	4	15	12	1		32	2	8	5	1	2	18
70-78	11	26	13	10	7	67	4	25	13	8	3	53
80-88	5	14	12	3	3	37	7	43	18	8	4	80
90-98		2	3	1	1	7	4	11	7	6	3	31
100-108						--	1	2	3	2	1	9
110-118			1			1						--
Mean	74.4	73.1	74.6	73.4	75.8	74.0	82.5	80.3	79.9	83.0	82.2	80.9
	Females - Diastolic (disappearance of sound)											
mm Hg												
0-18		1				1						--
20-28						--			1			1
30-38						--						--
40-48		1	1			2						--
50-58	2	9	5	2	1	19	1	1	4			6
60-68	9	23	18	3	4	57	2	22	9	5	2	40
70-78	7	19	10	9	4	49	6	28	15	5	6	60
80-88	2	8	7	2	3	22	8	31	13	11	4	67
90-98			1			1	1	6	6	3	1	17
100-108			1			1		1	1	1		3
Mean	68.8	66.9	69.0	69.9	71.9	68.5	77.3	75.7	74.6	78.1	78.2	76.0

APPENDIX TABLE 44. BIOCHEMICAL FINDINGS BY AGE AND LOCATION, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Sex Age (years)	Males and females 5-14							
Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Malacca	Total
				BLOOD				
Total Plasma Protein gm/100 ml								
No.	45	18	29	43	58	42	32	267
Mean	7.0	8.1	7.3	7.3	7.3	7.3	7.1	7.3
				Percent Distribution				
6.00-6.39 1/	6.7	--	--	--	1.7	--	3.1	1.9
6.40-6.99	48.9	--	24.1	27.9	20.7	28.6	37.5	28.8
≥7.00	44.4	100.0	75.9	72.1	77.6	71.4	59.4	69.3
Albumin/Globulin Ratio								
No.	45	18	29	43	58	41	32	266
Mean	1.3	0.9	1.2	0.9	1.2	1.3	1.0	1.1
				Percent Distribution				
<0.5	--	--	--	2.3	--	--	--	0.4
0.5-0.9	6.7	72.2	24.1	69.8	6.9	17.1	37.5	28.6
1.0-1.4	75.6	27.8	65.5	20.9	69.0	56.1	62.5	56.4
1.5-1.9	11.1	--	10.3	7.0	24.1	24.4	--	13.2
≥2.0	6.7	--	--	--	--	2.4	--	1.5
Plasma Albumin gm/100 ml								
No.	45	18	29	43	58	41	32	266
Mean	3.9	3.8	3.9	3.3	4.0	4.0	3.5	3.8
				Percent Distribution				
<2.5	--	--	--	4.6	--	--	--	0.8
2.5-3.4	15.6	22.2	17.2	60.5	1.7	9.8	43.8	22.9
3.5-5.0	84.4	77.8	82.8	34.9	98.3	90.2	56.2	76.3
>5.0	--	--	--	--	--	--	--	--
Plasma Globulin gm/100 ml								
No.	45	18	29	43	58	41	32	266
Mean	3.1	4.3	3.4	4.0	3.3	3.3	3.6	3.5
				Percent Distribution				
1.0-1.9	2.2	--	--	--	--	--	--	0.4
2.0-2.9	31.1	--	13.8	7.0	29.3	36.6	12.5	21.4
3.0-3.5	55.6	5.6	55.2	14.0	39.6	39.0	40.6	37.6
>3.5	11.1	94.4	31.0	79.1	31.0	24.4	46.9	40.6

1/ See Appendix Table 49 for categorization of biochemical distributions.

APPENDIX TABLE 44 (Continued) BIOCHEMICAL FINDINGS BY AGE AND LOCATION, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Males and nonpregnant, nonlactating females

15+

Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
52	40	50	22	34	24	2	14	238
7.2	7.8	7.4	7.6	7.4	7.4	7.8	7.7	7.5
Percent Distribution								
11.5	--	--	--	2.9	4.2	--	--	3.4
17.3	7.5	24.0	4.5	20.6	16.7	--	7.1	15.5
71.2	92.5	76.0	95.4	76.5	79.2	100.0	92.8	81.1
52	40	50	22	34	24	2	13	237
1.2	1.2	1.1	1.1	1.1	1.2	1.0	0.8	1.1
Percent Distribution								
--	--	--	4.5	--	--	--	--	0.4
13.5	25.0	22.0	27.3	35.3	29.2	50.0	61.5	26.2
67.3	52.5	66.0	54.5	61.8	54.2	50.0	38.5	59.5
17.3	22.5	12.0	9.1	2.9	12.5	--	--	12.6
1.9	--	--	4.5	--	4.2	--	--	1.3
52	40	50	22	34	24	2	13	237
3.8	4.2	3.9	3.8	3.8	3.9	3.9	3.4	3.9
Percent Distribution								
--	--	--	4.5	--	--	--	--	0.4
11.5	2.5	12.0	22.7	20.6	4.2	--	53.8	13.9
88.5	97.5	88.0	68.2	79.4	95.8	100.0	46.2	85.2
--	--	--	4.5	--	--	--	--	0.4
52	40	50	22	34	24	2	13	237
3.3	3.6	3.5	3.8	3.6	3.5	3.8	4.2	3.6
Percent Distribution								
--	--	--	--	--	--	--	--	--
30.8	17.5	16.0	13.6	5.9	16.7	--	--	16.9
48.1	40.0	42.0	40.9	41.2	41.7	--	7.7	40.5
21.2	42.5	42.0	45.4	52.9	41.7	100.0	92.3	42.6

APPENDIX TABLE 44 (Continued) BIOCHEMICAL FINDINGS BY AGE AND LOCATION, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Sex	Males and females							
Age (years)	5-14							
Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Malacca	Total
Hemoglobin gm/100 ml								
No.	45	18	30	40	58	43	32	266
Mean	13.5	13.5	12.6	13.6	12.8	13.8	12.8	13.2
			Percent Distribution					
<12.0	6.7	11.1	20.0	10.0	24.1	7.0	6.3	12.8
12.0-13.9	71.1	55.6	63.3	42.5	50.0	48.8	78.1	57.5
14.0-14.9	13.3	11.1	16.7	30.0	22.4	37.2	15.6	22.2
≥15.0	8.9	22.2	--	17.5	3.4	7.0	--	7.5
Hematocrit percent								
No.	45	18	29	34	58	42	32	258
Mean	39.8	41.5	38.4	37.5	39.3	40.3	38.0	39.2
			Percent Distribution					
<36	6.7	5.6	10.3	20.6	10.3	2.4	18.8	10.5
36-41	73.3	38.9	75.9	67.6	60.3	73.8	68.8	67.0
42-44	8.9	38.9	10.3	11.8	27.6	14.3	9.4	16.7
≥45	11.1	16.7	3.4	--	1.7	9.5	3.1	5.8
Mean Corpuscular Hemoglobin Concentration, percent								
No.	45	18	29	34	58	42	32	258
Mean	34.0	32.7	32.7	36.0	32.5	34.2	33.6	33.7
			Percent Distribution					
<28.0	--	--	13.8	5.9	5.2	4.8	3.1	4.6
28.0-29.9	2.2	5.6	3.4	2.9	8.6	--	--	3.5
30.0-31.9	15.6	38.9	10.3	2.9	17.2	7.1	21.9	14.7
≥32.0	82.2	55.6	72.4	88.2	69.0	88.1	75.0	77.1
Plasma Vitamin C mg/100 ml								
No.	45	18	28	25	58	42	32	248
Mean	0.65	0.60	0.79	0.30	0.79	1.11	0.59	0.73
			Percent Distribution					
<0.10	--	--	--	--	--	--	--	--
0.10-0.19	--	--	--	12.0	3.4	--	--	2.0
0.20-0.39	28.9	22.2	17.8	72.0	6.9	4.8	37.5	23.4
≥0.40	71.1	77.8	82.1	16.0	89.6	95.2	62.5	74.6

APPENDIX TABLE 44 (Continued) BIOCHEMICAL FINDINGS BY AGE AND LOCATION, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Males and nonpregnant, nonlactating females

15+

Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
50	40	46	21	35	24	6	14	236
14.5	14.2	12.4	14.6	12.7	13.9	12.8	14.0	13.6
Percent Distribution								
4.0	5.0	41.3	9.5	22.8	12.5	33.3	14.3	16.9
32.0	40.0	37.0	9.5	48.6	37.5	50.0	21.4	35.2
24.0	30.0	13.0	47.6	20.0	25.0	--	35.7	24.6
40.0	25.0	8.7	33.3	8.6	25.0	16.7	28.6	23.3
52	38	47	18	35	22	5	14	231
42.5	43.6	38.2	42.6	39.8	40.6	39.4	40.3	41.0
Percent Distribution								
7.7	--	21.3	5.6	11.4	18.2	40.0	14.3	11.7
38.5	34.2	57.4	33.3	48.6	36.4	20.0	42.8	42.4
15.4	26.3	12.8	33.3	20.0	22.7	20.0	21.4	19.9
38.5	39.5	8.5	27.8	20.0	22.7	20.0	21.4	26.0
50	38	44	18	35	22	5	14	226
34.2	32.6	32.5	34.7	27.7	34.0	34.6	34.8	33.3
Percent Distribution								
2.0	--	15.9	--	8.6	4.5	40.0	--	6.2
4.0	18.4	11.4	--	11.4	--	--	--	8.0
10.0	26.3	15.9	11.1	20.0	4.5	--	14.3	15.0
84.0	55.3	56.8	88.9	60.0	90.9	60.0	85.7	70.8
52	40	50	16	35	24	--	14	231
0.48	0.52	0.68	0.24	0.43	0.71	--	0.48	0.53
Percent Distribution								
--	--	--	--	5.7	--	--	--	0.9
13.5	10.0	--	50.0	5.7	--	--	21.4	10.4
32.7	30.0	16.0	43.8	42.8	16.7	--	21.4	28.6
53.8	60.0	84.0	6.2	45.7	83.3	--	57.1	60.2

APPENDIX TABLE 44 (Continued) BIOCHEMICAL FINDINGS BY AGE AND LOCATION, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Sex / Age (years)	Males and females 5-14							
Location	Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Malacca	Total
Plasma Vitamin A μg/100 ml								
No.	45	18	29	41	58	42	32	265
Mean	26.6	28.2	25.5	25.8	41.1	19.2	26.9	28.5
			Percent Distribution					
<10	--	--	3.4	--	--	23.8	--	4.2
10-19	15.6	27.8	20.7	24.4	13.8	38.1	12.5	21.1
20-49	82.2	61.1	75.9	73.2	46.6	38.1	87.5	64.5
≥50	2.2	11.1	--	2.4	39.6	--	--	10.2
Plasma Carotene μg/100 ml								
No.	45	18	29	41	58	42	32	265
Mean	80	64	64	90	71	74	78	76
			Percent Distribution					
<20	--	--	--	--	--	--	3.1	0.4
20-39	6.7	27.8	20.7	4.9	12.1	11.9	9.4	11.7
40-99	68.9	55.6	75.9	61.0	72.4	76.2	62.5	68.7
≥100	24.4	16.7	3.4	34.1	15.5	11.9	25.0	19.2
Plasma Cholesterol mg/100 ml								
No.	43	18	29	42	58	41	32	263
Mean	171	177	179	169	174	180	150	171
			Percent Distribution					
70-99	--	--	--	--	--	--	3.1	0.4
100-149	30.2	22.2	10.3	33.3	25.9	17.1	50.0	27.4
150-199	55.8	61.1	72.4	50.0	53.4	6[illegible].8	40.6	56.3
≥200	14.0	16.7	17.2	16.7	20.7	17.1	6.2	16.0
Plasma β-Lipoprotein[1/] mm								
No.	44	--	30	42	4	42	32	194
Mean	2.5	--	2.7	2.7	2.3	2.4	2.5	2.6
Plasma Lipid Phosphorus mg/100 ml								
No.	43	18	28	42	58	42	32	263
Mean	9.8	8.0	9.4	8.6	10.2	10.5	10.4	9.7

1/ By precipitin technic.

APPENDIX TABLE 44 (Continued) BIOCHEMICAL FINDINGS BY AGE AND LOCATION, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Males and nonpregnant, nonlactating females

15+

Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
52	39	48	22	33	24	--	14	232
39.9	38.2	30.6	43.7	51.8	26.3	--	43.2	38.5
				Percent Distribution				
--	--	2.1	--	--	12.5	--	--	1.7
1.9	--	10.4	4.5	--	29.2	--	--	6.0
86.5	87.2	83.3	63.6	48.5	45.8	--	71.4	73.3
11.5	12.8	4.2	31.8	51.5	12.5	--	28.6	19.0
52	39	48	22	33	24	--	14	232
103	82	69	107	74	99	--	126	90
				Percent Distribution				
--	--	4.2	--	--	--	--	--	0.9
1.9	7.7	8.3	--	18.2	4.2	--	--	6.5
50.0	66.7	72.9	45.4	66.7	50.0	--	28.6	58.2
48.1	25.6	14.6	54.5	15.2	45.8	--	71.4	34.5
52	40	50	22	35	24	2	14	239
192	190	188	197	194	203	130	203	193
				Percent Distribution				
1.9	--	--	--	--	--	50.0	--	0.8
17.3	15.0	12.0	9.1	17.1	8.3	--	--	13.0
36.5	50.0	56.0	45.4	45.7	45.8	50.0	57.1	47.3
44.2	35.0	32.0	45.4	37.1	45.8	--	42.8	38.9
51	--	50	22	3	23	2	14	165
2.7	--	2.9	3.4	2.9	2.8	2.8	2.6	2.8
52	40	48	22	35	24	2	13	236
11.5	9.0	9.4	7.2	10.7	10.8	8.8	11.7	10.0

APPENDIX TABLE 44 (Continued) BIOCHEMICAL FINDINGS BY AGE AND LOCATION, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Sex Age (years) Location	Males and females 5-14 Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Malacca	Total
				URINE				
Thiamine								
µg/gm creatinine								
No.	38	12	26	37	41	27	22	203
Median	106	72	150	118	86	147	111	113
				Percent Distribution				
<27	--	--	--	--	2.4	--	--	0.5
27-65	18.4	50.0	3.8	18.9	36.6	3.7	27.3	21.2
66-129	50.0	33.3	34.6	37.8	34.1	40.7	31.8	38.4
≥130	31.6	16.7	61.5	43.2	26.8	55.6	40.9	39.9
Riboflavin								
µg/gm creatinine								
No.	41	16	27	35	49	29	28	225
Median	33	30	48	48	28	52	35	38
				Percent Distribution				
<27	39.0	43.8	22.2	22.8	49.0	27.6	32.1	34.7
27-79	46.3	50.0	51.8	51.4	40.8	37.9	60.7	47.6
80-269	14.6	6.2	25.9	22.8	8.2	24.1	3.6	15.1
≥270	--	--	--	2.1	2.0	10.3	3.6	2.7
N'-Methyinicotinamide								
mg/gm creatinine								
No.	42	17	25	40	54	37	30	245
Median	6.4	8.3	9.0	6.2	8.6	6.2	7.0	7.3
				Percent Distribution				
<0.50	--	--	--	--	--	2.7	--	0.4
0.50-1.59	--	--	--	10.0	--	--	--	1.6
1.60-4.29	14.3	--	8.0	25.0	9.2	35.1	20.0	17.1
≥4.30	85.7	100.0	92.0	65.0	90.7	62.2	80.0	80.8

APPENDIX TABLE 44 (Continued) BIOCHEMICAL FINDINGS BY AGE AND LOCATION, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Males and nonpregnant, nonlactating females

15+

Johore	Kedah	Kelantan	Selangor	Perak	Pahang	Negri Sembilan	Malacca	Total
38	30	40	22	27	19	3	8	187
72	52	72	44	55	107	56	108	63
			Percent Distribution					
7.9	30.0	22.5	31.8	25.9	10.5	--	--	19.8
42.1	30.0	27.5	40.9	33.3	15.8	66.7	25.0	32.6
26.3	33.3	27.5	4.5	11.1	36.8	--	37.5	24.1
23.7	6.7	22.5	22.7	29.6	36.8	33.3	37.5	23.5
48	38	43	18	30	20	3	12	212
40	28	37	44	33	30	16	36	34
			Percent Distribution					
33.3	50.0	37.2	33.3	40.0	50.0	100.0	33.3	40.6
43.7	42.1	48.8	38.9	36.7	35.0	--	58.3	42.4
20.8	5.3	7.0	27.8	10.0	10.0	--	8.3	12.3
2.1	2.6	7.0	--	13.3	5.0	--	--	4.7
46	38	34	22	31	23	3	10	207
5.3	5.1	5.4	1.7	6.5	6.4	4.0	3.4	5.2
			Percent Distribution					
--	--	--	--	--	--	--	--	--
2.2	--	5.9	50.0	--	--	--	--	6.8
34.8	36.8	26.5	31.8	22.6	21.7	66.7	70.0	32.4
63.0	63.2	67.6	18.2	77.4	78.3	33.3	30.0	60.9

APPENDIX TABLE 45. BIOCHEMICAL FINDINGS BY SEX AND AGE, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Age Group (years)		Males 5-9	10-14	15-44	45+	Total
				BLOOD		
Total Plasma Protein gm/100 ml						
No.		57	82	80	23	242
Mean		7.2	7.4	7.4	7.2	7.4
S.E.1/		0.06	0.06	0.07	0.11	0.03
			Percent Distribution			
6.00-6.39	("Low")2/	3.5	1.2	5.0		2.9
6.40-6.99	("Acceptable")	33.3	19.5	13.8	39.1	22.7
≥7.00	("High")	63.2	79.3	81.2	60.9	74.4
Albumin/Globulin Ratio						
No.		57	82	80	23	242
Mean		1.1	1.1	1.2	1.1	1.1
S.E.		0.05	0.03	0.03	0.07	0.02
			Percent Distribution			
<0.5		1.8				0.4
0.5-0.9		26.3	30.5	17.5	34.8	25.6
1.0-1.4		57.9	57.3	61.2	56.5	58.7
1.5-1.9		12.3	11.0	20.0	4.3	13.6
≥2.0		1.8	1.2	1.2	4.3	1.6
Plasma Albumin gm/100 ml						
No.		57	82	80	23	242
Mean		3.7	3.8	4.0	3.6	3.8
S.E.		0.08	0.05	0.04	0.10	0.03
			Percent Distribution			
<2.5	("Deficient")	3.5				0.8
2.5-3.4	("Low")	22.8	22.0	6.2	30.4	17.8
3.5-5.0	("Acceptable")	73.7	78.0	92.5	69.6	81.0
>5.0	("High")			1.2		0.4
Plasma Globulin gm/100 ml						
No.		57	82	80	23	242
Mean		3.4	3.6	3.4	3.6	3.5
S.E.		0.10	0.07	0.07	0.14	0.04
			Percent Distribution			
1.0-1.9	("Deficient")		1.2			0.4
2.0-2.9	("Low")	26.3	12.2	22.5	21.7	19.8
3.0-3.5	("Acceptable")	36.8	42.7	48.8	30.4	42.1
>3.5	("High")	36.8	43.9	28.8	47.8	37.6

1/ S.E. = standard error.
2/ Distributions based upon the ICNND suggested guide to interpretation of blood and urine data where categorized as "deficient," etc. (see Appendix Table 49).

APPENDIX TABLE 45 (Continued) BIOCHEMICAL FINDINGS BY SEX AND AGE, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Nonpregnant, Nonlactating Females					Preg-	Lacta-
5-9	10-14	15-44	45+	Total	nant	ting
59	69	111	24	263	8	25
7.2	7.3	7.5	7.4	7.4	6.9	7.6
0.06	0.06	0.05	0.10	0.03	0.12	0.08
		Percent Distribution				
1.7	1.4	3.6		2.3		
32.2	33.3	11.7	16.7	22.4	75.0	4.0
66.1	65.2	84.7	83.3	75.3	25.0	96.0
58	69	110	24	261	8	25
1.2	1.2	1.1	1.0	1.1	0.9	1.0
0.08	0.04	0.03	0.04	0.02	0.06	0.06
		Percent Distribution				
		0.9		0.4		4.0
25.9	30.4	26.4	45.8	29.1	62.5	40.0
55.2	55.1	60.9	50.0	57.1	37.5	52.0
19.0	11.6	10.9	4.2	12.3		4.0
	2.9	0.9		1.1		
58	69	110	24	261	8	25
3.8	3.8	3.8	3.7	3.8	3.4	3.7
0.06	0.05	0.05	0.06	0.03	0.11	0.11
		Percent Distribution				
		0.9		0.4		4.0
25.9	21.7	14.5	20.8	19.5	62.5	16.0
74.1	78.3	84.5	79.2	80.1	37.5	80.0
				--		
58	69	110	24	261	8	25
3.4	3.5	3.6	3.8	3.6	3.6	3.9
0.08	0.08	0.07	0.11	0.04	0.16	0.15
		Percent Distribution				
				--		
29.3	21.7	13.6	8.3	18.8		8.0
34.5	34.8	39.1	29.2	36.0	37.5	32.0
36.2	43.5	47.3	62.5	45.2	62.5	60.0

APPENDIX TABLE 45 (Continued) BIOCHEMICAL FINDINGS BY SEX AND AGE, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

		Males				
Age Group (years)		5-9	10-14	15-44	45+	Total
Hemoglobin gm/100 ml						
No.		55	80	83	22	240
Mean		12.5	13.3	14.7	13.0	13.6
S.E.		0.33	0.13	0.19	0.56	0.13
			Percent Distribution			
<12.0	("Deficient")	18.2	10.0	7.2	36.4	13.3
12.0-13.9	("Low")	58.2	65.0	19.3	18.2	43.3
14.0-14.9	("Acceptable")	21.8	20.0	26.5	22.7	22.9
≥15.0	("High")	1.8	5.0	47.0	22.7	20.4
Hematocrit percent						
No.		55	78	80	20	233
Mean		37.6	39.7	44.8	39.0	40.9
S.E.		0.66	0.32	0.40	1.52	0.33
			Percent Distribution			
<36	("Deficient")	18.2	6.4		25.0	8.6
36-41	("Low")	69.1	70.5	17.5	25.0	48.1
42-44	("Acceptable")	10.9	7.9	22.5	25.0	18.4
≥45	("High")	1.8	5.1	60.0	25.0	24.9
Mean Corpuscular Hemoglobin Concentration percent						
No.		55	78	80	20	233
Mean		33.0	33.6	32.8	32.7	33.1
S.E.		0.51	0.32	0.36	0.86	0.21
			Percent Distribution			
<28.0		9.1	3.8	8.8	10.0	7.3
28.0-29.9		3.6	2.6	10.0	5.0	5.6
30.0-31.9		7.3	12.8	10.0	15.0	10.7
≥32.0		80.0	80.8	71.2	70.0	76.4
Plasma Vitamin C mg/100 ml						
No.		53	77	77	22	229
Mean		0.68	0.74	0.49	0.38	0.61
S.E.		0.05	0.05	0.03	0.06	0.02
			Percent Distribution			
<0.10	("Deficient")				4.5	0.4
0.10-0.19	("Low")	1.9	2.6	13.0	22.7	7.9
0.20-0.39	("Acceptable")	20.8	29.9	31.2	40.9	29.2
≥0.40	("High")	77.4	67.5	55.8	31.8	62.4

APPENDIX TABLE 45 (Continued) BIOCHEMICAL FINDINGS BY SEX AND AGE, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Nonpregnant, Nonlactating Females					Preg-nant	Lacta-ting
5-9	10-14	15-44	45+	Total		
60	71	107	24	262	8	27
13.2	13.7	13.2	12.8	13.3	11.2	12.9
0.18	0.17	0.42	0.27	0.10	0.37	0.35
		Percent Distribution				
16.7	8.4	21.5	12.5	16.0	75.0	22.2
53.3	52.1	42.0	75.0	50.4	25.0	44.4
25.0	22.5	27.1	8.3	23.7		25.9
5.0	16.9	9.3	4.2	9.9		7.4
59	66	108	23	256	8	26
39.5	39.7	39.0	39.1	39.3	32.8	38.3
0.34	0.45	0.41	0.74	0.23	1.30	0.87
		Percent Distribution				
8.5	10.6	18.5	8.7	13.3	75.0	19.2
69.5	59.1	57.4	73.9	62.1	25.0	57.7
16.9	19.7	18.5	13.0	18.0		15.4
5.1	10.6	5.6	4.3	6.6		7.7
59	66	103	23	251	8	26
33.4	34.6	34.0	32.5	33.9	34.0	34.3
0.38	0.64	0.44	0.50	0.27	0.82	0.87
		Percent Distribution				
3.4	3.0	3.9	4.3	3.6		
6.8	1.5	5.8	13.0	5.6		3.8
22.0	16.7	18.4	17.4	18.7	25.0	19.2
67.8	78.8	71.8	65.2	72.1	75.0	76.9
55	63	109	23	250	8	23
0.79	0.71	0.57	0.62	0.66	0.70	0.36
0.06	0.04	0.03	0.05	0.02	0.14	0.03
		Percent Distribution				
		0.9		0.4		
	3.2	7.3	4.3	4.4		8.7
21.8	19.0	28.4	8.7	22.8	37.5	60.9
78.2	77.8	63.3	87.0	72.4	62.5	30.4

APPENDIX TABLE 45 (Continued) BIOCHEMICAL FINDINGS BY SEX AND AGE, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Age Group (years)		Males				
		5-9	10-14	15-44	45+	Total
Plasma Vitamin A μg/100 ml						
No.		57	79	75	22	233
Mean		28.0	30.3	42.9	40.2	34.5
S.E.		1.7	1.7	1.5	3.4	1.0
			Percent Distribution			
<10	("Deficient")		2.5			0.8
10-19	("Low")	24.6	21.5	1.3	4.5	14.2
20-49	("Acceptable")	66.7	63.3	76.0	72.7	69.1
≥50	("High")	8.8	12.6	22.7	22.7	15.9
Plasma Carotene μg/100 ml						
No.		57	79	75	22	233
Mean		67	83	88	69	80
S.E.		4	5	4	7	2
			Percent Distribution			
<20	("Deficient")		1.3		4.5	0.8
20-39	("Low")	17.5	5.1	5.3	13.6	9.0
40-99	("Acceptable")	70.2	68.4	62.7	68.2	67.0
≥100	("High")	12.3	25.3	32.0	13.6	23.2
Plasma Cholesterol mg/100 ml						
No.		56	82	81	23	242
Mean		162	168	177	187	171
S.E.		5.4	3.4	4.2	8.8	2.4
			Percent Distribution			
70-99		1.8		1.2		0.8
100-149		37.5	30.5	22.2	8.7	27.3
150-199		51.8	56.1	51.8	60.9	54.1
≥200		8.9	13.4	24.7	30.4	17.8
Plasma β-Lipoprotein[1] mm						
No.		44	56	50	17	167
Mean		2.4	2.5	2.7	3.2	2.6
S.E.		0.08	0.06	0.09	0.16	0.04
Plasma Lipid Phosphorus mg/100 ml						
No.		57	81	81	23	242
Mean		9.7	9.5	9.7	9.1	9.6
S.E.		0.29	0.27	0.27	0.47	0.15

1/ By precipitin technic.

APPENDIX TABLE 45 (Continued) BIOCHEMICAL FINDINGS BY SEX AND AGE, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Nonpregnant, Nonlactating Females					Preg-	Lacta-
5-9	10-14	15-44	45+	Total	nant	ting
59	70	111	24	264	8	25
27.6	27.6	36.6	34.6	32.1	32.8	29.0
2.0	1.5	1.4	3.8	0.9	3.7	2.1
		Percent Distribution				
8.5	5.7	2.7	4.2	4.9		4.0
22.0	17.1	6.3	20.8	14.0	12.5	12.0
59.3	68.6	75.7	54.2	68.2	87.5	84.0
10.2	8.6	15.3	20.8	12.9		
59	70	111	24	264	8	25
70	78	94	98	85	115	84
5	3	4	7	2	14	6
		Percent Distribution				
		0.9		0.4		
18.6	8.6	5.4	8.3	9.5		8.0
64.4	71.4	56.8	41.7	61.0	25.0	68.0
16.9	20.0	36.9	50.0	29.2	75.0	24.0
56	69	111	24	260	8	25
175	180	202	209	191	208	191
4.1	3.8	4.3	8.5	2.5	22.2	9.7
		Percent Distribution				
			4.2	0.4		
19.6	21.7	9.9		14.2	25.0	16.0
58.9	58.0	45.0	29.2	50.0	37.5	48.0
21.4	20.3	45.0	66.7	35.4	37.5	36.0
43	51	78	20	192	7	20
2.7	2.7	2.8	3.1	2.8	3.2	2.6
0.08	0.06	0.06	0.13	0.04	0.38	0.14
56	69	108	24	257	8	24
10.1	9.7	10.3	10.8	10.2	11.7	10.2
0.31	0.25	0.25	0.58	0.15	1.16	0.38

APPENDIX TABLE 45 (Continued) BIOCHEMICAL FINDINGS BY SEX AND AGE, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

		Males				
Age Group (years)		5-9	10-14	15-44	45+	Total
Thiamine				URINE		
μg/gm creatinine						
No.		45	63	70	19	197
Median		138	104	58	44	88
			Percent Distribution			
<27	("Deficient")			20.0	26.3	9.6
27-65	("Low")	20.0	22.2	37.1	52.6	29.9
66-129	("Acceptable")	26.7	46.0	20.0	10.5	28.9
≥130	("High")	53.3	31.7	22.8	10.5	31.5
Riboflavin						
μg/gm creatinine						
No.		43	71	71	20	205
Median		48	30	36	35	37
			Percent Distribution			
<27	("Deficient")	23.2	46.5	38.0	35.0	37.6
27-79	("Low")	51.2	46.5	38.0	45.0	44.4
80-269	("Acceptable")	25.6	5.6	18.3	10.0	14.6
≥270	("High")		1.4	5.6	10.0	3.4
N'-Methylnicotinamide						
mg/gm creatinine						
No.		54	73	74	22	223
Median		7.3	5.8	4.6	4.7	5.6
			Percent Distribution			
<0.50	("Deficient")					--
0.50-1.59	("Low")		4.1	9.4	9.1	5.4
1.60-4.29	("Acceptable")	25.9	19.2	36.5	36.4	28.2
≥4.30	("High")	74.1	76.7	54.0	54.5	66.4

APPENDIX TABLE 45 (Continued) BIOCHEMICAL FINDINGS BY SEX AND AGE, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Nonpregnant, Nonlactating Females					Preg-	Lacta-
5-9	10-14	15-44	45+	Total	nant	ting
40	55	78	20	193	6	19
122	104	79	76	97	72	53
		Percent Distribution				
	1.8	19.2	15.0	9.8	16.7	21.0
15.0	25.4	24.3	30.0	23.3	33.3	42.1
40.0	38.2	29.5	30.0	34.2	33.3	31.6
45.0	34.5	26.9	25.0	32.6	16.7	5.3
51	60	98	23	232	7	22
42	35	30	38	35	57	24
		Percent Distribution				
25.5	36.7	44.9	34.8	37.5	28.6	54.5
47.0	46.7	43.9	47.8	45.7	42.8	27.3
19.6	15.0	8.2	13.0	12.9	28.6	13.6
7.8	1.7	3.1	4.3	3.9		4.5
52	66	88	23	229	8	23
9.4	7.7	5.6	5.1	6.9	11.7	4.5
		Percent Distribution				
1.9				0.4		
	1.5	4.5	4.3	2.6		
7.7	15.2	26.1	39.1	20.1	12.5	47.8
90.4	83.3	69.3	56.5	76.8	87.5	52.2

APPENDIX TABLE 46. BIOCHEMICAL FINDINGS BY AGE AND PERCENT "STANDARD WEIGHT," CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Sex	Males and Females						
Age (years)	6-16						
Percent "Standard Weight"	70-79	80-89	90-99	100-109	110+	Unknown	Total
				BLOOD			
Total Plasma Protein gm/100 ml							
No.	11	79	110	56	18	9	283
Mean	7.2	7.3	7.3	7.4	7.6	7.2	7.3
S.E.[1]	0.11	0.06	0.04	0.08	0.15	0.12	0.03
			Percent Distribution				
6.00-6.39[2]	--	2.5	1.8	1.8	5.6	--	2.1
6.40-6.99	36.4	26.6	29.1	28.6	5.6	22.2	26.8
≥7.00	63.6	70.9	69.1	69.6	88.9	77.8	71.0
Albumin/Globulin Ratio							
No.	11	79	109	56	18	9	282
Mean	0.9	1.2	1.2	1.1	1.2	1.1	1.1
S.E.	0.13	0.04	0.03	0.03	0.06	0.06	0.02
			Percent Distribution				
<0.5	--	--	0.9	--	--	--	0.4
0.5-0.9	54.5	26.6	28.4	26.8	16.7	22.2	27.6
1.0-1.4	36.4	54.4	55.0	64.3	66.7	77.8	57.4
1.5-1.9	9.1	15.2	14.7	8.9	16.7	--	13.1
≥2.0	--	3.8	0.9	--	--	--	1.4
Plasma Albumin gm/100 ml							
No.	11	79	109	56	18	9	282
Mean	3.4	3.8	3.8	3.8	4.0	3.8	3.8
S.E.	0.20	0.06	0.04	0.05	0.09	0.12	0.03
			Percent Distribution				
<2.5	--	--	1.8	--	--	--	0.7
2.5-3.4	54.5	20.2	21.1	23.2	5.6	22.2	21.6
3.5-5.0	45.4	79.7	77.1	76.8	94.4	77.8	77.6
>5.0	--	--	--	--	--	--	--
Plasma Globulin gm/100 ml							
No.	11	79	109	56	18	9	282
Mean	3.8	3.4	3.4	3.6	3.6	3.4	3.5
			Percent Distribution				
1.0-1.9	--	1.3	--	--	--	--	0.4
2.0-2.9	18.2	22.8	22.9	16.1	22.2	--	20.6
3.0-3.5	18.2	38.0	41.3	37.5	22.2	77.8	38.6
>3.5	63.6	38.0	35.8	46.4	55.6	22.2	40.4

1/ S.E. = standard error.
2/ See Appendix Table 49 for categorization of biochemical distributions.

APPENDIX TABLE 46 (Continued) BIOCHEMICAL FINDINGS BY AGE AND PERCENT "STANDARD WEIGHT," CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Males and Nonpregnant, Nonlactating Females						
			17+			
<80	80-89	90-99	100-109	110+	Unknown	Total
30	68	58	28	28	3	215
7.4	7.4	7.4	7.6	7.4	8.3	7.4
0.08	0.07	0.08	0.09	0.11	--	0.04
		Percent Distribution				
--	5.9	3.4	--	3.6	--	3.2
16.7	11.8	20.7	7.1	21.4	--	15.3
83.3	82.4	75.9	92.8	75.0	100.0	81.4
30	67	58	28	28	3	214
1.1	1.1	1.1	1.1	1.2	0.9	1.1
0.06	0.03	0.04	0.05	0.06	0.10	0.02
		Percent Distribution				
--	1.5	--	--	--	--	0.5
20.0	31.3	29.3	21.4	21.4	66.7	27.1
63.3	59.7	58.6	71.4	50.0	33.3	59.8
13.3	7.5	12.1	3.6	25.0	--	11.2
3.3	--	--	3.6	3.6	--	1.4
30	67	58	28	28	3	214
3.9	3.8	3.8	3.9	4.0	3.8	3.8
0.10	0.06	0.06	0.07	0.07	--	0.03
		Percent Distribution				
--	1.5	--	--	--	--	0.5
13.3	19.4	17.2	7.1	7.1	--	14.5
83.3	79.1	82.8	92.8	92.8	100.0	84.6
3.3	--	--	--	--	--	0.5
30	67	58	28	28	3	214
3.5	3.6	3.6	3.7	3.4	4.4	3.6
		Percent Distribution				
--	--	--	--	--	--	--
16.7	13.4	19.0	3.6	32.1	--	16.4
46.7	41.8	32.8	53.6	32.1	33.3	40.2
36.7	44.8	48.3	42.8	35.7	66.7	43.4

APPENDIX TABLE 46 (Continued) BIOCHEMICAL FINDINGS BY AGE AND PERCENT "STANDARD WEIGHT," CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Sex	Males and Females						
Age (years)	6-16						
Percent "Standard Weight"	70-79	80-89	90-99	100-109	110+	Unknown	Total
Hemoglobin gm/100 ml							
No.	9	79	109	55	18	10	280
Mean	13.3	13.3	13.4	13.0	14.1	13.1	13.3
S.E.	1.15	0.19	0.14	0.22	0.27	0.43	0.10
	Percent Distribution						
<12.0	22.2	12.6	11.9	12.7	--	20.0	12.1
12.0-13.9	44.4	51.9	55.0	60.0	44.4	70.0	54.6
14.0-14.9	--	27.8	24.8	23.6	33.3	--	24.3
≥15.0	33.3	7.6	8.2	3.6	22.2	10.0	8.9
Hematocrit percent							
No.	10	74	106	54	18	10	272
Mean	35.3	40.0	40.0	39.0	40.7	41.3	39.4
S.E.	2.20	0.45	0.32	0.49	0.78	1.12	0.23
	Percent Distribution						
<36	40.0	13.5	7.5	9.2	5.6	--	10.3
36-41	50.0	54.0	70.8	72.2	55.6	60.0	64.3
42-44	--	24.3	15.1	14.8	27.8	20.0	18.0
≥45	10.0	8.1	6.6	3.7	11.1	20.0	7.4
Mean Corpuscular Hemoglobin Concentration, percent							
No.	9	74	106	54	18	10	271
Mean	38.3	33.4	33.7	33.4	35.0	32.0	33.7
	Percent Distribution						
<28.0	11.1	5.4	2.8	3.7	--	10.0	4.0
28.0-29.9	--	2.7	1.9	7.4	--	10.0	3.3
30.0-31.9	--	16.2	16.0	18.5	--	20.0	15.1
≥32.0	88.9	75.7	79.2	70.4	100.0	60.0	77.5
Plasma Vitamin C mg/100 ml							
No.	5	71	104	56	18	9	263
Mean	0.80	0.76	0.70	0.71	0.70	0.82	0.72
	Percent Distribution						
<0.10	--	--	--	--	--	--	--
0.10-0.19	--	2.8	2.9	1.8	--	--	2.3
0.20-0.39	--	18.3	26.0	23.2	16.7	22.2	22.0
≥0.40	100.0	78.9	71.2	75.0	83.3	77.8	75.7

APPENDIX TABLE 46 (Continued) BIOCHEMICAL FINDINGS BY AGE AND PERCENT "STANDARD WEIGHT," CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Males and Nonpregnant, Nonlactating Females						
17+						
<80	80-89	90-99	100-109	110+	Unknown	Total
32	70	58	24	28	2	214
13.6	13.4	13.6	14.0	13.9	12.7	13.6
0.40	0.30	0.24	0.34	0.35	--	0.14
Percent Distribution						
25.0	22.8	13.8	16.7	10.7	--	18.2
28.1	31.4	48.3	29.2	28.6	100.0	35.5
15.6	27.1	15.5	29.2	32.1	--	22.9
31.2	18.6	22.4	25.0	28.6	--	23.4
31	67	56	24	28	3	209
41.3	40.5	40.8	42.1	41.2	37.3	41.0
0.99	0.76	0.53	1.06	0.77	0.68	0.35
Percent Distribution						
16.1	16.4	8.9	12.5	7.1	--	12.4
35.5	34.3	51.8	29.2	53.6	100.0	42.1
16.1	19.4	19.6	16.7	25.0	--	19.1
32.2	29.8	19.6	41.7	14.3	--	26.3
31	67	55	22	28	2	205
33.1	33.0	33.3	33.0	33.8	33.4	33.2
Percent Distribution						
9.7	10.4	3.6	4.5	3.6	--	6.8
12.9	9.0	5.4	4.5	14.3	--	8.8
16.1	11.9	14.5	18.2	14.3	50.0	14.6
61.3	68.6	76.4	72.7	67.8	50.0	69.8
29	67	56	26	28	3	209
0.58	0.53	0.46	0.52	0.53	0.51	0.52
Percent Distribution						
--	1.5	1.8	--	--	--	1.0
6.9	7.5	14.3	19.2	7.1	33.3	11.0
20.7	32.8	37.5	19.2	35.7	--	30.6
72.4	58.2	46.4	61.5	57.1	66.7	57.4

APPENDIX TABLE 46 (Continued) BIOCHEMICAL FINDINGS BY AGE AND PERCENT "STANDARD WEIGHT," CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Sex	Males and Females						
Age (years)	6-16						
Percent "Standard Weight"	70-79	80-89	90-99	100-109	110+	Unknown	Total
Plasma Vitamin A µg/100 ml							
No.	10	79	108	56	17	9	279
Mean	28.9	29.6	28.5	30.7	36.5	27.3	29.7
	Percent Distribution						
<10	--	--	3.7	3.6	11.8	22.2	3.6
10-19	10.0	20.2	23.1	21.4	5.9	--	19.7
20-49	80.0	72.2	64.8	58.9	58.8	66.7	65.9
≥50	10.0	7.6	8.3	16.1	23.5	11.1	10.8
Plasma Carotene µg/100 ml							
No.	10	79	108	56	17	9	279
Mean	86	82	74	76	78	59	77
	Percent Distribution						
<20	--	--	0.9	--	--	--	0.4
20-39	--	7.6	11.1	12.5	17.6	22.2	10.8
40-99	90.0	65.8	71.3	66.1	58.8	77.8	68.8
≥100	10.0	26.6	16.7	21.4	23.5	--	20.1
Plasma Cholesterol mg/100 ml							
No.	11	78	107	56	18	9	279
Mean	165	176	170	172	182	173	173
	Percent Distribution						
70-99	--	--	--	--	--	--	--
100-149	45.4	21.8	29.9	25.0	27.8	22.2	26.9
150-199	36.4	56.4	54.2	58.9	44.4	77.8	55.2
≥200	18.2	21.8	15.9	16.1	27.8	--	17.9
Plasma β-Lipoprotein[1/] mm							
No.	10	59	70	31	8	8	196
Mean	2.5	2.5	2.9	2.5	2.5	2.4	2.6
Plasma Lipid Phosphorus mg/100 ml							
No.	11	78	107	56	18	9	279
Mean	9.4	9.6	9.6	9.8	9.4	9.7	9.6

1/ By precipitin technic.

APPENDIX TABLE 46 (Continued) BIOCHEMICAL FINDINGS BY AGE AND PERCENT "STANDARD WEIGHT," CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Males and Nonpregnant, Nonlactating Females

17+						
≤80	80-89	90-99	100-109	110+	Unknown	Total
27	67	57	28	28	3	210
33.4	37.1	40.3	38.9	41.2	33.3	38.2
		Percent Distribution				
--	3.0	1.8	--	3.6	--	1.9
11.1	9.0	1.8	3.6	10.7	--	6.7
74.1	71.6	70.2	82.1	60.7	100.0	71.9
14.8	16.4	26.3	14.3	25.0	--	19.5
27	67	57	28	28	3	210
74	88	91	95	102	72	89
		Percent Distribution				
7.4	--	--	--	--	--	1.0
3.7	6.0	8.8	7.1	7.1	--	6.7
59.2	61.2	56.1	50.0	53.6	100.0	57.6
29.6	32.8	35.1	42.8	39.3	--	34.8
31	68	58	28	28	3	216
184	184	196	202	217	158	194
		Percent Distribution				
--	1.5	1.7	--	--	--	0.9
12.9	16.2	6.9	10.7	7.1	66.7	12.0
58.0	51.5	48.3	50.0	28.6	--	47.7
29.0	30.9	43.1	39.3	64.3	33.3	39.4
24	49	37	20	23	2	155
2.9	2.6	2.9	3.3	3.1	2.8	2.9
30	66	58	28	28	3	213
8.9	10.1	10.8	9.6	11.4	7.6	10.2

APPENDIX TABLE 46 (Continued) BIOCHEMICAL FINDINGS BY AGE AND PERCENT "STANDARD WEIGHT," CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Sex	Males and Females						
Age (years)	6-16						
Percent "Standard Weight"	70-79	80-89	90-99	100-109	110+	Unknown	Total
			URINE				
Thiamine µg/gm creatinine							
No.	9	60	84	46	12	6	217
Median	164	115	118	82	91	147	110
			Percent Distribution				
<27	--	1.7	1.2	--	--	--	0.9
27-65	33.3	13.3	16.7	41.3	33.3	16.7	22.6
66-129	--	45.0	39.3	34.8	41.7	16.7	37.8
≥130	66.7	40.0	42.8	23.9	25.0	66.7	38.7
Riboflavin µg/gm creatinine							
No.	10	63	95	48	16	7	239
Median	64	48	36	36	24	46	39
			Percent Distribution				
<27	20.0	23.8	36.8	33.3	62.5	14.3	33.0
27-79	40.0	55.6	45.3	58.3	37.5	42.8	49.8
80-269	40.0	20.6	13.7	6.2	--	42.8	15.1
≥270	--	--	4.2	2.1	--	--	2.1
N'-Methylnicotinamide mg/gm creatinine							
No.	10	72	102	52	17	6	259
Median	7.3	8.3	7.0	6.4	7.0	5.4	7.2
			Percent Distribution				
<0.50	--	1.4	--	--	--	--	0.4
0.50-1.59	--	4.2	1.0	3.8	--	--	2.3
1.60-4.29	20.0	9.7	19.6	19.2	23.5	16.7	17.0
≥4.30	80.0	84.7	79.4	76.9	76.5	83.3	80.3

APPENDIX TABLE 46 (Continued) BIOCHEMICAL FINDINGS BY AGE AND PERCENT "STANDARD WEIGHT," CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Males and Nonpregnant, Nonlactating Females 17+						
<80	80-89	90-99	100-109	110+	Unknown	Total
29	56	40	22	19	2	168
64	70	54	54	62	46	60
Percent Distribution						
13.8	21.4	20.0	27.3	26.3	50.0	21.4
37.9	26.8	42.5	31.8	26.3	--	32.7
31.0	23.2	12.5	27.3	31.6	50.0	23.8
17.2	28.6	25.0	13.6	15.8	--	22.0
28	59	51	23	27	3	191
36	31	26	38	33	32	32
Percent Distribution						
35.7	45.8	52.9	26.1	40.7	33.3	42.9
50.0	35.6	31.4	47.8	48.1	66.7	40.3
10.7	15.2	9.8	13.0	7.4	--	11.5
3.6	3.4	5.9	13.0	3.7	--	5.2
27	57	51	25	25	1	186
5.0	5.1	5.6	3.8	6.2		5.0
Percent Distribution						
--	--	--	--	--	--	--
3.7	7.0	3.9	16.0	4.0	--	6.4
33.3	33.3	35.3	44.0	28.0	100.0	34.9
63.0	59.6	60.8	40.0	68.0	--	58.6

APPENDIX TABLE 47. SUGGESTED VALUES BY SEX AND AGE GROUPS FOR HEMOGLOBIN AND HEMATOCRIT

	Deficient	Low	Acceptable	High
			Hemoglobin	
Males				
≥13 years	<12	12.0-13.9	14.0-14.9	≥15.0
Females				
nonpregnant, nonlactating				
≥13 years	<10.0	10.0-10.9	11.0-14.4	≥14.5
Children				
3-12 years	<10.0	10.0-10.9	11.0-12.4	≥12.5
			Hematocrit	
Males				
≥13 years	<36	36-41	42-44	≥45
Females				
nonpregnant, nonlactating				
≥13 years	<30	30-37	38-42	≥43
Children				
3-12 years	<30.0	30.0-33.9	34.0-36.9	≥37.0

APPENDIX TABLE 48. IODINE EXCRETION VS. PRESENCE OF GOITER, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Urinary Iodine Excretion µg/gm creatinine	<15 Years Total Group	<15 Years Enlarged Thyroid No.	<15 Years Enlarged Thyroid Percent	15+ Years Total Group	15+ Years Enlarged Thyroid No.	15+ Years Enlarged Thyroid Percent
0-9	--			--		
10-19	5			1		
20-29	20	1		7	1	
30-39	19	1		12	3	
40-49	11	1		9		
50-99	20	2		16	2	
100+	7			8		
Total	82	5	6.1	53	6	11.3
Mean	53	50		135	43	

Urinary Iodine	Total Group	Enlarged Thyroid No.	Enlarged Thyroid Percent
<20	8	--	--
20-29	37	2	5.4
30-39	44	4	9.1
40-49	30	1	3.3
50+	72	4	5.6
Total	191	11	5.8

APPENDIX TABLE 49. SUGGESTED GUIDE TO INTERPRETATION OF BIOCHEMICAL DATA[1/]

	Deficient	Low	Acceptable	High
Blood				
Total Plasma Protein, gm/100 ml	< 6.00	6.00–6.39	6.40–6.99	≥7.00
Plasma Albumin, gm/100 ml	< 2.5	2.5–3.4	3.5–5.0	≥5.0
Plasma Globulin, gm/100 ml	< 2.0	2.0–2.9	3.0–3.5	≥3.5
Albumin/Globulin Ratio	< 1.0	1.0–1.4	1.5–1.9	≥2.0
Hemoglobin, gm/100 ml	<12.0	12.0–13.9	14.0–14.9	≥15.0
Hematocrit, percent	<36	36–41	42–44	≥45
Mean Corpuscular Hemoglobin Concentration, percent	<28.0	28.0–29.9	30.0–31.9	≥32.0
Plasma Vitamin A, μg/100 ml	<10	10–19	20–49	≥50
Plasma Carotene, μg/100 ml	<20	20–39	40–99	≥100
Plasma Vitamin C, mg/100 ml	< 0.10	0.10–0.19	0.20–0.39	≥0.40
Urine				
Thiamine, μg/gm creatinine	<27	27–65	66–129	≥130
Riboflavin, μg/gm creatinine	<27	27–79	80–269	≥270
N'-Methylnicotinamide, mg/gm creatinine	< 0.50	0.50–1.59	1.60–4.29	≥4.30

1/ Based on ICNND suggested reference values.

APPENDIX TABLE 50. MEAN NUMBER OF DMF[1/] TEETH PER PERSON BY AGE, FEDERATION OF MALAYA, 1962

	Males						Civilian Females		All Males and Females	
	Military		Civilian		All Males					
Age (years)	No.	Mean DMF	No.	Mean DMF	No.	Mean DMF	No.	Mean DMF	No.	Mean DMF
0-4			56	0.00	127	0.00	53	0.09	222	0.02
5-9			380	1.10	409	1.04	376	1.40	822	1.17
10-14			368	3.10	370	3.11	261	3.69	634	3.35
15-19	46	3.89	123	5.79	169	5.27	88	6.17	293	5.71
20-24	221	4.25	78	4.43	299	4.30	53	5.92	483	5.13
25-29	104	5.57	53	5.96	157	5.70	64	7.14	273	6.48
30-34	65	6.10	43	5.32	108	5.79	66	10.33	194	7.77
35-39	23	5.95	36	5.80	59	5.86	46	10.60	109	7.92
40-44	1	9.00	44	7.86	45	7.88	58	10.62	104	9.49
45-49			32	11.78	32	11.78	43	11.46	75	11.60
50+			134	19.35	134	19.35	137	16.23	271	17.77

1/ Diseased, missing, filled.

APPENDIX TABLE 51. MEAN NUMBER OF DMF[1/] TEETH PER PERSON BY AREA OF ORIGIN, FEDERATION OF MALAYA, 1962

	Males						Civilian Females		All Males and Females	
	Military		Civilian		All Males					
Area of Origin	No.	Mean DMF	No.	Mean DMF	No.	Mean DMF	No.	Mean DMF	No.	Mean DMF
Selangor	44	4.89	226	2.42	275	2.77	214	3.76	489	3.20
Kelantan	21	4.81	146	11.59	175	10.25	175	8.61	350	9.43
Pahang	14	3.29	146	2.75	161	2.78	182	4.08	343	3.47
Johore	66	5.03	178	4.30	248	4.42	147	5.61	395	4.86
Malacca/Negri Sembilan	133	5.00	128	5.59	301	4.61	195	6.46	496	5.34
Perak	106	4.74	255	2.23	366	2.78	337	3.78	725	3.24
Kedah	40	4.90	191	5.83	240	5.46	171	5.28	411	5.38
Trengganu	9	6.78	3	5.33	13	5.92	6	11.5	19	7.68
Penang	19	5.21	5	15.00	25	6.96	19	8.68	44	7.70
All others	8	3.25			83	9.94	125	12.5	208	11.5

1/ Diseased, missing, filled.

APPENDIX TABLE 52. MEAN PERIODONTAL INDEX BY AGE, FEDERATION OF MALAYA, 1962

Age (years)	Males						Civilian Females		All Males and Females	
	Military		Civilian		All Males					
	No.	PI[1/]	No.	PI	No.	PI	No.	PI	No.	PI
0-4			56	0.0250	127	0.0181	53	0.0188	222	0.0148
5-9			380	0.0857	409	0.0806	376	0.0960	822	0.0846
10-14			368	0.1502	370	0.1494	261	0.1069	634	0.1312
15-19	46	0.1869	123	0.1634	169	0.1698	88	0.1079	293	0.1679
20-24	221	0.1832	78	0.2679	299	0.2053	53	0.3528	483	0.2472
25-29	104	0.4173	53	0.7773	157	0.5388	64	0.6796	273	0.6428
30-34	65	0.6718	43	1.2488	108	0.9037	66	1.4400	194	1.0968
35-39	23	1.1478	36	1.2342	59	1.2000	46	1.4886	109	1.3056
40-44	1	2.10	44	2.8279	45	2.8113	58	1.9666	104	1.3460
45-49			32	3.7142	32	3.7142	43	2.9205	75	3.2522
50+			134	5.0129	134	5.0129	137	3.9908	228	4.4750

1/ Periodontal Index.

APPENDIX TABLE 53. PERIODONTAL INDEX BY AREA OF ORIGIN, FEDERATION OF MALAYA, 1962

Area of Origin	Males						Civilian Females		All Males and Females	
	Military		Civilian		All Males					
	No.	Mean PI[1/]	No.	Mean PI	No.	Mean PI	No.	Mean PI	No.	Mean PI
Selangor	44	0.3955	226	0.2516	275	0.2701	197	0.3489	489	0.2953
Kelantan	21	0.2619	146	0.0415	175	1.7050	148	1.5294	350	1.5090
Pahang	14	0.2857	146	0.4369	161	0.4453	170	0.6976	343	0.565
Johore	66	0.2492	178	0.5652	248	0.4729	128	0.6938	395	0.5398
Malacca/Negri Sembilan	133	0.3165	128	0.9904	301	0.5587	98	1.2608	496	0.676
Perak	106	0.4000	255	0.3278	388	0.3247	235	0.3732	725	0.342
Kedah	40	0.4725	199	0.7037	240	0.6394	150	0.0515	411	0.556
Trengganu	9	0.4444	3	0.1667	13	0.3462	1	0.000	19	0.289
Penang	19	0.3211	5	2.3000	25	0.6375	10	0.1020	44	0.470
All others	8	0.9250	69	3.0828	83	2.6256	108	2.5204	208	2.383

1/ Periodontal Index.

APPENDIX TABLE 54. MEAN ATTRITION BY AGE, FEDERATION OF MALAYA, 1962

Age (years)	Males: Military No.	Males: Military Attrition	Males: Civilian No.	Males: Civilian Attrition	Males: All Males No.	Males: All Males Attrition	Civilian Females No.	Civilian Females Attrition	All Males and Females No.	All Males and Females Attrition
0-4			56	0.0000	127	0.0000	53	0.0000	222	0.0000
5-9			380	0.0098	409	0.0096	376	0.0326	822	0.0204
10-14			368	0.1814	370	0.1804	261	0.2216	634	0.1968
15-19	46	0.9586	123	0.8418	169	0.8738	88	0.7713	293	0.8089
20-24	221	0.9873	78	1.0792	299	1.0110	53	0.8705	483	0.9655
25-29	104	0.9701	53	1.0943	157	1.0121	64	1.0682	273	1.0077
30-34	65	1.0843	43	1.2904	108	1.1660	66	1.1464	194	1.1635
35-39	23	1.1565	36	1.6085	59	1.4293	46	1.4976	109	1.4490
40-44	1	0.600	44	1.6571	45	1.6325	58	1.6340	104	1.6256
45-49			32	1.8629	32	1.8629	43	2.0176	75	1.9491
50+			134	2.0586	134	2.0586	137	2.1010	271	2.0803

APPENDIX TABLE 55. ATTRITION BY AREA OF ORIGIN, FEDERATION OF MALAYA, 1962

Area of Origin	Males: Military No.	Males: Military Attrition	Males: Civilian No.	Males: Civilian Attrition	Males: All Males No.	Males: All Males Attrition	Civilian Females No.	Civilian Females Attrition	All Males and Females No.	All Males and Females Attrition
Selangor	44	0.8977	226	0.2345	275	0.3556	197	0.3355	489	0.3581
Kelantan	21	1.1667	146	0.9609	175	0.9841	148	0.8810	350	0.930
Pahang	14	0.8500	146	0.2653	161	0.326	170	0.5245	343	0.0347
Johore	66	0.9062	178	0.4419	248	0.5720	128	0.4955	395	0.5637
Malacca/Negri Sembilan	133	1.0150	128	0.7426	301	0.8677	98	0.8202	496	0.829
Perak	106	1.0642	225	0.3365	388	0.5624	235	0.4491	725	0.563
Kedah	40	1.0825	191	1.0082	240	1.0079	150	0.7607	411	0.922
Trengganu	9	0.9444	3	1.4000	13	1.0583	1	0.4000	19	0.922
Penang	19	0.9000	5	0.5500	23	0.8391	10	0.1200	44	0.870
All others	8	1.0375	69	3.0828	83	1.7113	108	1.6680	208	1.627

APPENDIX TABLE 56. MEAN RECESSION BY AGE, FEDERATION OF MALAYA, 1962

Age (years)	Males: Military No.	Males: Military Recession	Males: Civilian No.	Males: Civilian Recession	Males: All Males No.	Males: All Males Recession	Civilian Females No.	Civilian Females Recession	All Males and Females No.	All Males and Females Recession
0-4			56	0.00	127	0.00	53	0.00	222	0.00
5-9			380	0.00	409	0.00	376	0.00	822	0.00
10-14			368	0.06	370	0.06	261	0.08	634	0.07
15-19	46	0.39	123	1.09	169	0.89	88	0.71	293	0.99
20-24	221	1.87	78	3.47	299	2.29	53	3.56	483	2.51
25-29	104	6.93	53	10.54	157	8.15	64	7.09	273	8.12
30-34	65	11.21	43	19.83	108	14.63	66	15.81	194	14.90
35-39	23	22.13	36	23.37	59	22.87	46	25.18	109	23.92
40-44	1	42.00	44	35.80	45	35.95	58	32.56	104	33.93
45-49			32	50.33	32	50.33	43	42.20	75	45.53
50+			134	67.62	134	67.62	137	57.01	271	61.96

APPENDIX TABLE 57. MEAN RECESSION BY AREA OF ORIGIN, FEDERATION OF MALAYA, 1962

Area of Origin	Males: Military No.	Males: Military Recession	Males: Civilian No.	Males: Civilian Recession	Males: All Males No.	Males: All Males Recession	Civilian Females No.	Civilian Females Recession	All Males and Females No.	All Males and Females Recession
Selangor	44	4.16	226	3.69	275	3.70	197	5.19	489	4.23
Kelantan	21	12.38	146	25.82	175	22.74	148	18.15	350	19.20
Pahang	14	7.14	146	5.44	161	5.56	170	7.82	343	6.57
Johore	66	4.15	178	7.48	248	6.48	128	7.80	395	6.70
Malacca/Negri Sembilan	133	4.47	128	9.04	301	6.69	98	15.79	496	7.94
Perak	106	5.14	255	2.27	388	2.90	235	4.56	725	3.61
Kedah	40	5.40	191	6.61	240	6.17	150	5.16	416	5.97
Trengganu	9	3.33	3	11.33	13	4.92	1	0.0	19	3.53
Penang	19	8.79	5	24.25	25	11.00	10	3.20	44	7.70
All others	8	7.25	69	45.95	83	38.45	108	40.64	208	3.64

APPENDIX TABLE 58. MEAN DEBRIS BY AGE, FEDERATION OF MALAYA, 1962

Age (years)	Males: Military No.	Males: Military Debris	Males: Civilian No.	Males: Civilian Debris	All Males No.	All Males Debris	Civilian Females No.	Civilian Females Debris	All Males and Females No.	All Males and Females Debris
0-4			56	1.2803	127	1.2425	53	1.2792	222	1.2520
5-9			380	1.5036	409	1.4887	376	1.4890	822	1.4760
10-14			368	1.4502	370	1.4478	261	1.2542	634	1.3654
15-19	46	1.2000	123	1.0284	169	1.0751	88	0.9022	293	1.0010
20-24	221	1.0131	78	1.0987	299	1.0354	53	1.2132	483	1.0246
25-29	104	1.0240	53	1.2679	157	1.1063	64	1.2562	273	1.1341
30-34	65	1.1078	43	1.4162	108	1.2317	66	1.2718	194	1.2031
35-39	23	1.2565	36	1.6085	59	1.4689	46	1.0318	109	1.2764
40-44	1	1.2000	44	1.6380	45	1.6279	58	1.4803	104	1.5390
45-49			32	1.6444	32	1.6444	43	1.7000	75	1.6772
50+			134	1.6764	134	1.6764	137	1.4752	271	1.5725

APPENDIX TABLE 59. MEAN DEBRIS BY AREA OF ORIGIN, FEDERATION OF MALAYA, 1962

Area of Origin	Males: Military No.	Males: Military Debris	Males: Civilian No.	Males: Civilian Debris	All Males No.	All Males Debris	Civilian Females No.	Civilian Females Debris	All Males and Females No.	All Males and Females Debris
Selangor	44	1.1455	226	1.2933	275	1.2668	197	1.2577	489	1.252
Kelantan	21	1.0238	146	1.5922	175	1.4994	148	1.4640	350	1.436
Pahang	14	1.1714	146	1.4924	161	1.4673	170	1.3675	343	1.417
Johore	66	1.0800	178	1.5017	248	1.3858	128	1.4357	395	1.371
Malacca/Negri Sembilan	133	1.0594	129	1.3361	301	1.1980	98	1.2969	496	1.180
Perak	106	1.0170	255	1.4775	388	1.3269	235	1.4661	725	1.322
Kedah	40	1.0975	191	1.2622	240	1.2389	150	1.0758	411	1.181
Trengganu	9	0.0556	3	1.1000	13	0.9385	1	1.0000	19	0.942
Penang	19	0.9316	5	1.2250	25	1.0042	10	1.1200	44	1.002
All others	8	1.2625	69	1.5754	83	1.5200	108	1.3165	208	1.395

APPENDIX TABLE 60. MEAN CALCULUS BY AGE, FEDERATION OF MALAYA, 1962

Age (years)	Males: Military No.	Males: Military Calculus	Males: Civilian No.	Males: Civilian Calculus	All Males No.	All Males Calculus	Civilian Females No.	Civilian Females Calculus	All Males and Females No.	All Males and Females Calculus
0-4			56	0.0178	127	0.0157	52	0.0094	222	0.0113
5-9			380	0.0461	409	0.0441	376	0.0669	822	0.0541
10-14			368	0.3450	370	0.3437	261	0.2661	634	0.3106
15-19	9	0.5222	123	0.5447	169	0.6035	88	0.3829	293	0.5273
20-24	16	0.4625	78	0.7948	299	0.7411	53	0.7811	483	0.7045
25-29	5	0.8600	53	0.9792	157	0.9267	64	0.8953	273	0.8985
30-34	1	0.8000	43	1.2441	108	1.1364	66	0.9250	194	1.0214
35-39			36	1.3685	59	1.2741	46	0.9500	109	1.1377
40-44			44	1.3000	45	1.2883	58	1.1678	104	1.2210
45-49			32	1.5074	32	1.5074	43	1.3461	75	1.4121
50+			134	1.4558	134	1.4558	137	1.2522	271	1.3507

APPENDIX TABLE 61. MEAN CALCULUS BY AREA OF ORIGIN, FEDERATION OF MALAYA, 1962

Area of Origin	Males: Military No.	Males: Military Calculus	Males: Civilian No.	Males: Civilian Calculus	All Males No.	All Males Calculus	Civilian Females No.	Civilian Females Calculus	All Males and Females No.	All Males and Females Calculus
Selangor	44	0.7932	226	0.3400	275	0.4066	197	0.3776	489	0.396
Kelantan	21	0.9190	146	0.7256	175	0.7177	148	0.7081	350	0.700
Pahang	14	1.1071	146	0.2521	161	0.3258	170	0.4506	343	0.392
Johore	66	0.7523	178	0.6337	248	0.6547	128	0.5595	395	0.618
Malacca/Negri Sembilan	133	0.8022	128	0.6328	301	0.6251	98	0.5165	496	0.572
Perak	106	0.8283	255	0.2506	388	0.3935	235	0.2584	725	0.359
Kedah	40	0.9000	191	0.6741	240	0.6868	150	0.3893	411	0.570
Trengganu	9	0.7889	3	1.1000	13	0.8000	1	0.0000	19	0.747
Penang	19	0.9053	5	0.9000	25	0.8667	10	0.4700	44	0.716
All others	8	1.2125	69	1.3033	83	1.1893	108	1.0330	208	1.057

APPENDIX TABLE 62. MEAN ORAL HYGIENE INDEX BY AREA OF ORIGIN, FEDERATION OF MALAYA, 1962

Area of Origin	Males: Military No.	Males: Military OHI 1/	Males: Civilian No.	Males: Civilian OHI	All Males No.	All Males OHI	Civilian Females No.	Civilian Females OHI	All Males and Females No.	All Males and Females OHI
Selangor	44	1.9386	226	1.6333	275	1.6733	197	1.6352	489	1.647
Kelantan	21	1.9429	129	2.3178	175	2.2171	148	2.1721	350	2.136
Pahang	14	2.2786	146	1.7444	161	1.7931	170	1.8180	343	1.809
Johore	66	1.8323	178	2.1354	248	2.0405	128	1.9952	395	1.990
Malacca/Negri Sembilan	133	1.8617	128	1.9689	301	1.8231	98	1.8134	496	1.752
Perak	106	1.8453	255	1.7281	388	1.7205	235	1.7245	725	1.681
Kedah	40	1.9975	191	1.9362	240	1.926	150	1.4051	411	1.752
Trengganu	9	1.6444	3	2.2000	13	1.7385	1	1.0000	19	1.689
Penang	19	1.8368	5	2.1250	25	1.8708	10	1.5900	44	1.719
All others	8	2.4750	69	2.8788	83	2.7093	108	2.3495	208	2.451

1/ Oral Hygiene Index.

APPENDIX TABLE 63. MEAN ORAL HYGIENE INDEX BY AGE, FEDERATION OF MALAYA, 1962

Age (years)	Males: Military No.	Males: Military OHI 1/	Males: Civilian No.	Males: Civilian OHI	All Males No.	All Males OHI	Civilian Females No.	Civilian Females OHI	All Males and Females No.	All Males and Females OHI
0-4			56	1.2982	127	1.2582	52	1.2886	222	1.2633
5-9			380	1.5498	409	1.5328	376	1.5560	822	1.530
10-14			368	1.7953	370	1.7915	261	1.5203	634	1.6760
15-19	46	1.9608	123	1.5731	169	1.6786	88	1.2852	293	1.5283
20-24	221	1.7352	78	1.8935	299	1.7765	53	1.9943	483	1.7291
25-29	104	1.9240	53	2.2471	157	2.0331	64	2.1515	273	2.0327
30-34	65	2.1718	43	2.6604	108	2.3682	66	2.1968	194	2.2246
35-39	23	2.3869	36	2.9771	59	2.7431	46	1.9818	109	2.4141
40-44	1	2.0000	44	2.9380	45	2.9162	58	2.6482	104	2.7600
45-49			32	3.1518	32	3.1518	43	3.0461	75	3.0893
50+			134	3.1323	134	3.1323	137	2.7275	271	2.9232

1/ Oral Hygiene Index.

APPENDIX TABLE 64. A COMPARISON OF ORAL HEALTH ACCORDING TO RACE, FEDERATION OF MALAYA, 1962

	Males						Civilian Females		All Males and Females	
	Military		Civilian		All Males					
	No.	Score	No.	Score	No.	Score	No.	Score	No.	Score
Debris										
Malayan	409	1.0597	685	1.4597	1,189	1.3050	626	1.3308	2,112	1.273
Chinese	31	1.0871	461	1.4022	496	1.3885	443	1.3637	953	1.371
Other	19	1.0263	157	1.2822	180	1.2507	136	1.2941	328	1.248
Calculus										
Malayan	409	0.8625	685	0.6222	1,189	0.6565	626	0.5361	2,112	0.600
Chinese	31	0.5548	465	0.3439	496	0.3571	443	0.4174	953	0.384
Other	19	0.6947	157	0.5401	180	0.5444	136	0.4566	328	0.502
Oral Hygiene Index										
Malayan	409	1.9220	685	2.0819	1,189	1.9615	626	1.8669	2,112	1.873
Chinese	31	1.6419	465	1.7460	496	1.7456	443	1.7810	953	1.755
Other	19	1.7211	157	1.8223	180	1.7950	136	1.7507	320	1.750
DMF 1/										
Malayan	410	0.0465	719	0.0575	1,224	0.0495	646	0.0576	2,170	0.0526
Chinese	31	0.0816	471	0.0452	505	0.0474	463	0.0688	982	0.0580
Other	19	0.0442	157	0.0266	180	0.0279	136	0.0299	328	0.0290
Periodontal Index										
Malayan	409	0.3738	693	0.9768	1,197	0.694	629	0.8893	2,126	0.709
Chinese	31	0.2129	465	0.5671	499	0.5417	454	0.7971	967	0.661
Other	19	0.2368	157	0.6038	180	0.5517	136	0.5831	328	0.546
Recession										
Malayan	409	0.0559	687	0.1130	1,190	0.0845	630	0.1045	2,118	0.844
Chinese	31	0.0316	465	0.0769	498	0.0738	452	0.1222	964	0.0958
Other	19	0.0200	155	0.0768	178	0.0690	136	0.0767	326	0.0701
Attrition										
Malayan	409	1.0244	632	0.7179	1,152	0.7575	565	0.7076	1,857	0.793
Chinese	31	0.9000	422	0.4685	453	0.4980	395	0.6443	858	0.570
Other	19	0.6789	144	1.4597	163	0.5190	125	0.4584	299	0.505

1/ Diseased, missing, filled.

APPENDIX TABLE 65. A COMPARISON OF DMF[1] TEETH OF PERSONS IN SOUTHEAST ASIA[2]

	Age (years)										
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50+
Thailand (1)											
Military males					0.727	1.809	1.377	1.000	2.737	4.500	25.00
Civilian males		0.149	0.388	0.837	0.800	0.375	0.734	0.910	2.378	3.957	10.281
Civilian females		0.175	0.756	1.085	1.171	0.870	0.833	0.946	2.471	3.074	10.613
All persons		0.162	0.585	1.000	0.744	1.417	0.952	0.936	2.480	3.395	10.572
South Vietnam (8)											
All military				2.19	1.94	1.94	1.57	1.60	3.11		11.00
Burma (2)											
Military males				0.55	0.64		0.91		1.91		2.71
Military male dependents		0.1	0.4	0.9							
Military female dependents		0.1	0.6	1.1	1.2		1.8		3.4		13.0
Republic of China (9)											
Military males				4.50	2.81	1.65	1.64	1.87	1.82	2.17	5.50
Malaya											
Military males				3.89	4.25	5.57	6.10	5.95	9.00		
Civilian males	0.00	1.10	3.10	5.79	4.43	5.96	5.32	5.80	7.86	11.78	19.35
All males	0.00	1.04	3.11	5.27	4.30	5.70	5.79	5.86	7.88	11.78	19.35
Civilian females	0.09	1.40	3.69	6.17	5.92	7.14	10.33	10.60	10.62	11.46	16.35
All males and females	0.02	1.17	3.35	5.71	5.13	6.48	7.77	7.92	9.49	11.60	17.77
Military male dependents	0.00	0.002	0.040								
Military female dependents	0.00	0.003	0.033	0.066	0.067	0.080	0.100	0.750	0.160		

1/ Diseased, missing, filled.
2/ Numbers in parentheses refer to references on p. 162.

APPENDIX 66. TYPES OF FISH FOUND IN THE MALAY DIET
(as determined by the recipe method)

Malay name	Family	Preparation and serving	
Ikan tenggiri	Spanish mackerel	Fresh	
Ikan bilis	Anchovy		Dry, salted
Ikan temerong		Fresh	
Udang	Shrimp	Fresh	Dry, salted
Ikan aruan	(Paddy fish)	Fresh	Dry, salted
Ikan pelata	Tiny mackerel	Fresh	
Ikan kerisi	Sea bream		Dry, salted
Ikan otek		Fresh	
Ikan ayam	Tunny		Dry, salted
Ikan chencham	Horse mackerel	Fresh	Dry, salted
Ikan batok	Tunny (paddy fish)	Fresh	
Ikan loma		Fresh	
Ikan selar	Horse mackerel	Fresh	
Ikan tambun	Herring	Fresh	
Ikan bawal	Pomfret	Fresh	
Kerang	Cockles	Fresh	
Ikan bangkok			Dry, salted
Ikan gelama	Jew fish		Dry, salted
Ikan buluayam			Dry, salted
Ikan kembong	Tiny mackerel		Dry, salted
Ikan talang			Dry, salted
Ikan sepat			Dry, salted
Ikan pari			Dry, salted
Ikan merah	Sea perch	Fresh	
Ikan kirang			

APPENDIX 67. FRUITS AND VEGETABLES COMMONLY FOUND IN THE MALAYAN DIET

English name	Malay name
Vegetables	
Leafy green (dark and light)	
Chives	Kuchai
Cabbage	Kobis
Spinach	Bayam puteh
Mustard greens	Sawi puteh
Kankong	Kankong
Wild fern shoots	Puchok paku
Sweet potato tops	Daun keledek
Tapioca shoots	Puchok ubi kayu
Chinese cabbage	Sayor puteh
Chekor manis	Chekor manis
Lambok	Lambok
Yellow	
Banana inflorescence	Jantong pisang
Gourd	Labu puteh
Tomato	Terong belanda
Carrot	Lobak merah
Pumpkin	Labu merah

APPENDIX 67 (Continued) FRUITS AND VEGETABLES COMMONLY FOUND IN THE MALAYAY DIET

English name	Malay name
Vegetables (continued)	
Nonleafy vegetables	
Cucumber	Timun
Ladies' finger	Bendi
Eggplant	Terong
Bean sprouts	Tangeh
Long green beans	Kachang panjang
Yellow, green and red chillies	Chabai
Bitter gourd	Peria
Root vegetables	
Sweet potato	Ubi keledek
White (Irish) potato	Ubi gantang
Onion	Bawang
Tapioca	Ubi kayu
Nuts, Seeds, Peas	
Four-angled bean	Kachang botor
Drumstick	Kelor (or Marunggai)
Jering nut	
Green gram or mung bean	Kachang hijan
Ground nut	
Green peas	Kachang puteh
Dhall	
Fruits	
Papaya	Buah betek
Rambutan	Rambutan
Banana	Pisang
Pineapple	Nanas
Limes	Limau
Langsat	Langsat
Duku	Duku
Mangosteen	Manggis
Sapodilla	Chiku
Jak fruit	Nangka, Champedak
Durian	Durian
Pommelo	Limau bali
Mango	Mangga

APPENDIX TABLE 68. FOOD INTAKE BY FOOD GROUPS, GRAMS PER STANDARD MAN PER DAY, 25 MALAYAN CIVILIAN FAMILIES[1/], [2/]
(Recipe Method)

Location	Kelantan	Pahang	Johore	Malacca	Perak	Kedah	Total	Average for each location
No. persons	9	23	38	23	44	19	156	
Cereals								
Rice (as purchased)	281.0	389.0	300	430.0	340	252.0	1,992	334.0
Flour (wheat, rice, sago)	--	37.0	80.0	160.0	37.0	100	314	78.0
Bread	--	47	--	--	38.0	--	85	42.5
Store biscuits	--	--	--	3.0	--	--	3.0	3.0
Fish								
Fresh fish	--	44.0	120.0	75.0	61.0	80.0	380	76.0
Dried salted fish	90.0	27.0	22.0	30.0	24.0	10.0	203	34.0
Belachan	--	5.0	19.0	13.0	2.0	2.0	41	8.2
Fish condiments (ikan bilis, udang)	--	10.0	12.0	10.0	14.0	25.0	71	14.2
Meat								
Buffalo, mutton, other	50.0	80.0	--	--	--	--	130	65.0
Other Protein Foods								
Eggs, tofu	--	60.0	47.0	31.0	6.0	26.0	170	34.0
Leafy Green Vegetables								
Sawi Bayam Paku Kobis Kankong, others	--	60	65	40	58	50	273	54.6
Other Vegetables Timun, bendi, Kachang panjang, terong, tangeh green gram, labu, jantong, others	--	142	65	82	134	230	653	130

APPENDIX TABLE 68 (Continued) FOOD INTAKE BY FOOD GROUPS, GRAMS PER STANDARD MAN PER DAY, 25 MALAYAN CIVILIAN FAMILIES[1/], [2/]

(Recipe Method)

Location	Kelantan	Pahang	Johore	Malacca	Perak	Kedah	Total	Average for each location
No. persons	9	23	38	23	44	19	156	
Root Vegetables	--	53.0	63.0	25.0	85.0	18.0	244	49.0
Keledek, ubi gantang, ubi kayu, bamboo shoots, others								
Condiment Vegetables								
Bawang	1.0	3.0	10.0	15.0	16.0	40.0	85.0	14.3
Chilli kering	0.3	--	1.0	9.5	1.0	4.5	16.3	3.2
Chilli merah	--	10.0	17.0	4.5	5.0	18.0	54.5	10.9
Garlic	--	0.3	1.0	1.0	0.3	0.7	3.3	0.6
Bananas	--	134.0	85.0	29.0	30.0	70.0	348	69
Other Fruits	--	--	--	40.0	--	92.0	132	66.0
Papaya, rambutan Duku, chiku, others								
Milk								
Condensed	--	20.0	15.0	7.0	24.0	11.0	77.0	13.0
Santan (liquid from scraped coconut)	45.0	201.0	45.0	190	135.0	142	758	126.3
Beverage	--	--	3.0	--	--	--	3.0	3.0
Chocolate drink								
Coffee	2.0	5.6	5.0	4.3	5.0	4.0	2.59	5.0
Sugar	20.0	50.0	70.0	49.0	24.0	40.0	253	42.1
Coconut Oil	30.0	60.0	60.0	58	70.0	65	343	57.1
Soya sauce	--	--	--	--	0.3	0.7	1.0	0.17
Sour Fruit	--	--	0.5	0.6	0.3	0.6	2.0	0.33
Tamarind, asam, other								
Spices	0.3	1.0	1.0	0.5	0.5	0.6	3.9	0.65
Kunyit, kayu manis, serai, karrupillay								
Coconut (flesh)	--	--	26.0	31.0	--	--	57.0	28.5

1/ The intakes of children less than 1 year of age are not included in this Table.
2/ These figures are as purchased weights.

APPENDIX TABLE 69. GLOSSARY OF MALAY COOKING TERMS

Belachan	Prawns dried and aged in brine to produce a fish paste. Strong smelling and like soft cheese in consistency. A staple of the Malay daily diet, it is served as sambal.
Goreng	Any food fried in coconut oil.
Gulai	Meat, fish, or vegetable dishes cooked wet as a curry.
Gulai masak pedas	Vegetables cooked in water with condiment, and a sour fruit, such as asam gelugor or tamarind, added.
Ikan	Malay word for fish.
Ikan bilis	Tiny, dried, herring-like fish commonly used as a condiment in cooking.
Kemangi	Sweet basil.
Kechap	Soy sauce.
Kuali	A round-bottomed iron skillet, used for frying over the open fire.
Lemak	A vegetable that is cooked by boiling in santan.
Gulai lemak	Vegetables cooked in coconut milk containing condiments.
Nasi	Cooked rice.
Puchok	The young green shoots or leaves of a root vegetable. The leaves are eaten as a vegetable before the root is matured.
Rempah	The spice and condiments that are made into a paste and added to curry.
Rendang	Vegetables, meat, or fish cooked dry.
Sambal	A generic term for condiments served separately but eaten with vegetables, fish, or curried meat dishes.
Sambal goreng	Vegetables fried in coconut oil to which sambal is added.
Santan	The liquid obtained from scraped coconut mixed with water and forced through a strainer.
Sayor	Malay word for vegetable.
Sayor manis	Vegetables cooked in water containing condiments.
Halia	Fresh ginger root.
Serai	Lemon grass.
Telor	Malay word for eggs.

APPENDIX 70. INDIVIDUAL DIETARY RECALL, SCHOOL CHILDREN, MALAYA, 1962

Date ______________________ Location Code No. ______________________

Name ______________________ Sex M F Race (Malay, Chinese, Indian, European)

Date of Birth ______________ Interviewer ______________________

What foods did you eat yesterday? (Day of week ______________________)

Time	Foods eaten	Amount	Comments
6 - 9:00 a.m.			
9 - 12:00 a.m.			
12 - 2:00 p.m.			
2 - 6:00 p.m.			
6 - 10:00 p.m.			

Make note if feast day or holiday.

APPENDIX 71. HOME DIETARY INTAKE FORM, ICNND MALAYA SURVEY - 1962

Recipe Method

Family No. ____________

No. Persons in Household ________

No. Persons Eating ________

Kampong ____________

State ____________

Date ____________

Menu Item	Ingredients	Raw Weight: Gross wt.	Raw Weight: Tare wt.	Raw Weight: Net raw wt.	Cooked Weight: Gross wt.	Cooked Weight: Tare wt.	Cooked Weight: Net cooked wt.	Leftover wt. (cooked)	No. persons eating	Total wt. consumed	Gm/person consumed	10 percent of gm/person consumed

APPENDIX TABLE 72. URINE SODIUM EXCRETIONS IN RELATION TO AGE, BLOOD PRESSURE AND PLASMA CHOLESTEROL LEVELS, MILITARY, MALAYA

	Age (years)					Total	Plasma cholesterol (mg/100 ml)			
	18-19	20-24	25-29	30-34	35-39		<100	100-149	150-199	200+
Urine Sodium gm/gm creatinine										
Number	5	20	18	13	2	58	1	12	20	24
Mean	5.66	3.80	3.53	3.17	3.64	3.73	7.54	4.05	3.78	3.35

	Blood pressure (mm Hg)	
	≥140/90	<140/90
Urine Sodium gm/gm creatinine		
Number	4	54
Mean	4.00	3.71

APPENDIX TABLE 73. URINE SODIUM EXCRETIONS BY AGE AND SEX, BLOOD PRESSURE AND PLASMA CHOLESTEROL LEVELS, CIVILIANS AND MILITARY DEPENDENTS, MALAYA

Sex	Males					Females 1/				
Age (years)	5-9	10-14	15-44	45+	Total	5-9	10-14	15-44	45+	Total
Urine Sodium gm/gm creatinine										
Number	16	18	18	5	57	14	19	18	5	56
Mean	9.03	6.43	3.43	2.26	5.85	5.74	6.06	4.03	5.54	5.28

Age (years)	Males and females 5-14					Males and females 1/ 15+				
Cholesterol levels gm/100 ml	<100	100-149	150-199	200+	Total	<100	100-149	150-199	200+	Total
Number	--	19	35	12	67	--	10	21	14	46
Mean		8.31	6.31	5.96	6.80		3.78	3.51	3.80	3.77

	Ages and sexes combined	
	≥140/90	<140/90
Blood pressure mm Hg		
Number	5	80
Mean	3.16	5.00

1/ Nonpregnant, nonlactating.

APPENDIX 74

In addition to the data presented in the figures and tables in the text and the Appendix, statistical studies were made on the correlations listed below. Many of them could serve as a basis for further studies. These data are on file in the Biostatistics Division, Department of Preventive Medicine, Vanderbilt University, in care of Mr. Edwin B. Bridgforth, Associate Professor of Biostatistics. Copies of any or all of this additional material may be had upon application to Mr. Bridgforth.

Military

Rural vs. urban origin by location
Physical activity by location
Religion by location
Race by location
Messing practices by location
Examiner by location (abbreviated examinations)
Clinical findings by area of origin (abbreviated examinations)
Clinical findings by time in service (abbreviated examinations)
Clinical findings by religion and race (abbreviated examinations)
Height, weight and percent of "standard weight" by location
Height, weight, percent of "standard weight" and age by time in service and race
Height by age
Weight by messing practice and religion
Percent "standard weight" by religion
Systolic and diastolic blood pressure by location and race
Systolic and diastolic blood pressure by examiner
Difference of diastolic blood pressures (change of sound minus disappearance of sound) by location, race, age, examiner and percent "standard weight"
Age distribution by location (detailed examinations)
Clinical findings by area of origin (detailed examinations)
Clinical findings by age (detailed examinations)
Arm and scapula skinfold thickness by location
Arm and scapula skinfold thickness by percent "standard weight" and examiner
Pulse rate by location, age, percent "standard weight" and examiner
Age distribution by location, biochemical examinations
Biochemical findings by messing practice
Iodine excretions by location, age and messing practice

Civilians and Military Dependents

Race by sex and age, rural vs. urban and religion
Activity by location
Religion and examiner by location
Age distribution by location, sexes combined, abbreviated examinations, civilians only
Age distribution by location, sexes separately and combined, abbreviated examinations, military dependents only
Clinical findings by sex and age, abbreviated examinations, civilians only
Clinical findings by age and location, sexes combined, abbreviated examinations, military dependents only
Clinical findings by area of origin and age groups, sexes combined, abbreviated examinations

Clinical findings by percent "standard weight" by sex and age, abbreviated examinations
Clinical findings by religion and rural vs. urban, abbreviated examinations
Percent "standard weight" by age and sex, 6-16 years
Height, weight and percent "standard weight" by age, males and nonpregnant, nonlactating females 15+ years
Height, weight and percent "standard weight" by sex, age, location and race, males and nonpregnant, nonlactating females
Age by location and race, males and nonpregnant, nonlactating females 15+ years
Systolic and diastolic blood pressure by age, males and nonpregnant, nonlactating females, by location and race
Systolic and diastolic blood pressure by age, males and nonpregnant, nonlactating females, by examiner and percent "standard weight"
Difference of diastolic blood pressures (change of sound minus disappearance of sound) by sex, age, location, race, examiner and percent "standard weight"
Hypertensive blood pressure levels by race and sex, 15+ years
Age distribution by sex and location, detailed examinations
Clinical findings by religion and rural vs. urban, detailed examinations
Clinical findings by area of origin, males and nonpregnant, nonlactating females (sexes combined), detailed examinations
Clinical findings by percent "standard weight," males and nonpregnant, nonlactating females, detailed examinations
Arm and scapula skinfold thickness, males and nonpregnant, nonlactating females, by age and sex, examiner, location and percent "standard weight"
Pulse rate, males and nonpregnant, nonlactating females by age and sex, location, percent "standard weight" and examiner
Age distribution by sex, location and race, biochemical examinations
Biochemical findings, males and nonpregnant, nonlactating females, by sex and age by decades, 15+ years
Biochemical findings by race
Iodine excretions by sex and age
Iodine excretions by race, age and location, males and nonpregnant, nonlactating females combined

<u>Correlations</u>

Thiamine excretion vs. N'-methylnicotinamide excretion, military
Riboflavin excretion vs. thiamine and N'-methylnicotinamide excretions, military
Plasma vitamin C levels vs. plasma vitamin A and carotene levels, military
Plasma vitamin A levels vs. plasma carotene levels, military
Hemoglobin levels vs. total plasma protein, military
Plasma cholesterol vs. β-lipoproteins vs. lipid phosphorus, military
Thiamine excretion vs. N'-methylnicotinamide excretion, by age, males and nonpregnant, nonlactating females combined, civilians and military dependents
Riboflavin excretion vs. thiamine and N'-methylnicotinamide excretions by age, males and nonpregnant, nonlactating females combined, civilians and military dependents
Riboflavin excretion vs. N'-methylnicotinamide excretion by age, males and nonpregnant, nonlactating females combined, civilians and military dependents
Plasma vitamin C levels vs. plasma vitamin A and carotene levels by age, males and nonpregnant, nonlactating females combined, civilians and military dependents

Plasma vitamin A levels vs. plasma carotene levels by age, males and nonpregnant, nonlactating females combined, civilians and military dependents
Hemoglobin levels vs. total plasma protein by age and sex (nonpregnant, nonlactating females), civilians and military dependents
Plasma cholesterol vs. β-lipoproteins by age, males and nonpregnant, nonlactating females combined, civilians and military dependents
Plasma cholesterol vs. lipid phosphorus by age, males and nonpregnant, nonlactating females combined, civilians and military dependents
Plasma cholesterol, lipid phosphorus, β-lipoproteins, systolic and diastolic blood pressures by individuals, total survey group
Riboflavin excretion vs. angular lesions and angular scars by age, civilians and military dependents
Thiamine excretion vs. loss of reflexes, civilians and military dependents
Plasma vitamin C levels vs. gum lesions, total survey group
Iodine excretion vs. goiter by age, civilians and military dependents

Special Studies
Height, weight and percent "standard weight" by sex and race, diabetes study, civilians
Age and sex distributions of subjects receiving electrocardiograms, diabetes study, total group
Location by sex and race of subjects receiving electrocardiograms, civilians
Electrocardiographic findings by sex and age by decades and by 5-year age groups, civilians
Electrocardiographic findings by sex and location, civilians
Electrocardiographic findings by sex and percent "standard weight," civilians
Electrocardiographic findings by location, military
Hypertension vs. left ventricular hypertrophy, military, and by sex, civilians
Heart symptoms by sex and location, civilians
Angina vs. electrocardiographic findings by sex, civilians
Identification of arteriosclerotic heart disease by sex, civilians
Heart sounds, military, civilians by sex, civilians by age (sexes combined), civilians by electrocardiographic findings
Combinations of electrocardiographic findings, military, and civilians by sex
Two-hour blood glucose by sex and age and by location, civilians
Two-hour blood glucose by 0-hour blood glucose levels, civilians
Blood and urine glucose levels by fasting time, civilians
Zero-hour blood glucose levels by sex and age, civilians
Percent "standard weight" by sex, age and diagnosis of diabetes, civilians
Zero-hour vs. two-hour urine glucose, civilians and military
"Diabetic" levels of 2-hour blood glucose levels by race, sex and age, civilians
Electrocardiographic findings vs. diagnosis of diabetes by sex, civilians
Plasma cholesterol levels by age, percent "standard weight" and location, military, diabetes study
Plasma cholesterol levels by location, civilians, diabetes study
Plasma cholesterol levels, sex and age by location, civilians, diabetes study
Plasma cholesterol levels by age and location, civilian men, diabetes study
Plasma cholesterol levels by age and sublocation, Kuala Lumpur, civilian men, diabetes study

Plasma cholesterol levels by sex and systolic blood pressure levels, civilians, diabetes study
Systolic blood pressure levels by sex and plasma cholesterol levels, civilians, diabetes study
Plasma cholesterol levels vs. heart disease classification by sex
Percent prevalence of parasitism by sex and age groups 5-12, 13-24, 25-39 and 40+ years, civilians

Pediatric
Religion vs. race, children 0-4 years
Clinical findings by examiner, children 0-4 years (abbreviated examinations)
Biochemical findings by age, race and location, sexes combined, children 0-4 years
Parasitologic findings, sexes and ages combined, children 0-4 years
Arm and scapula skinfold thickness by sex and age and by age, sexes combined, children 0-4 years
Pulse rate by sex and age and by age, sexes combined, children 0-4 years
Infrequent clinical findings by individual, pediatric sample

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